RAILROAD GAZETTE

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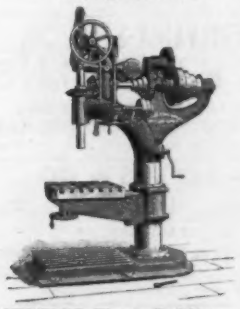

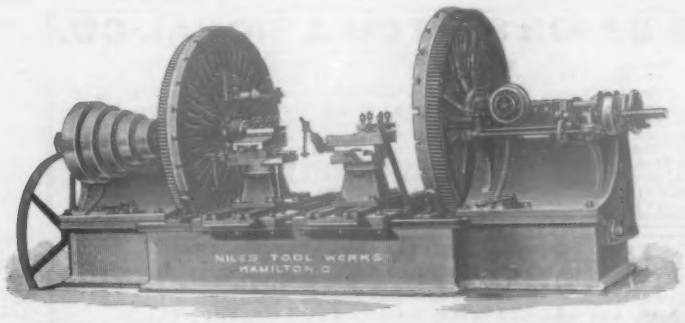

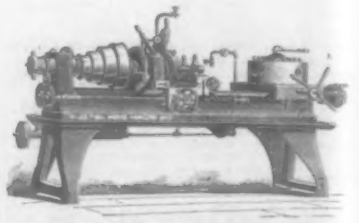

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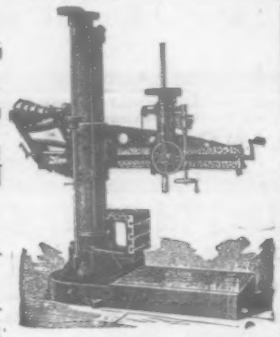

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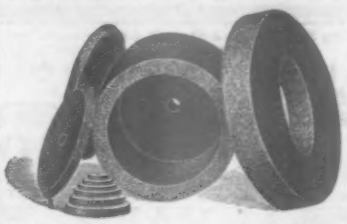

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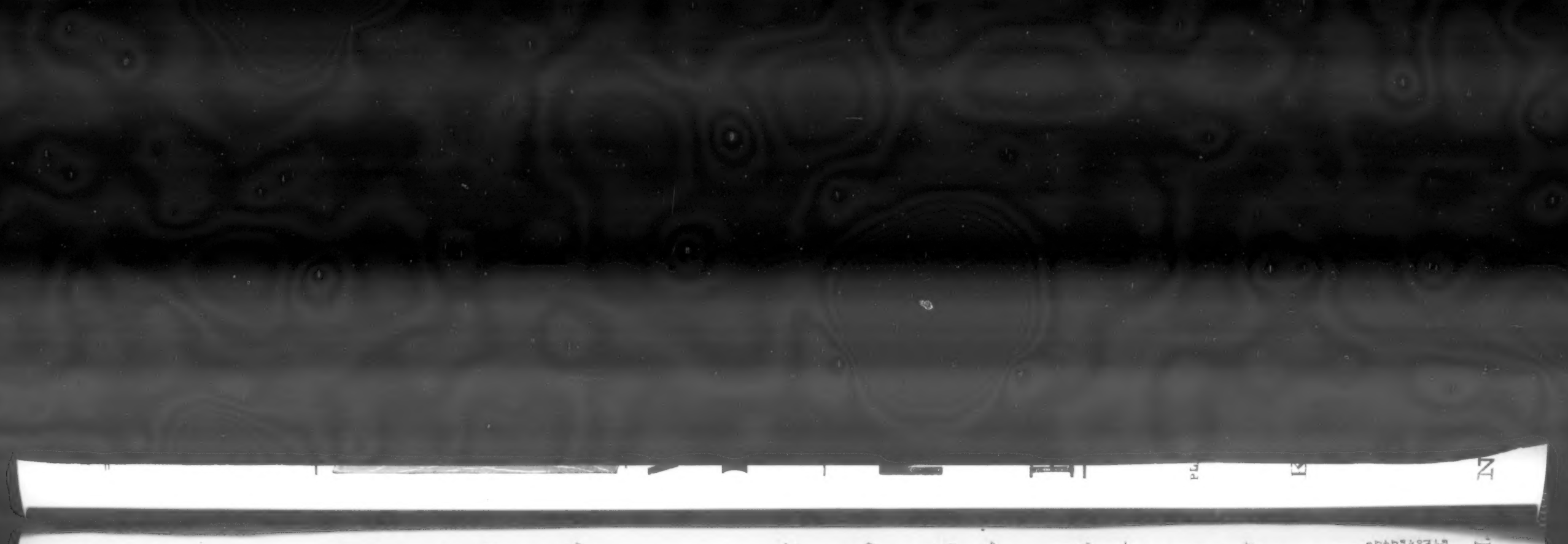

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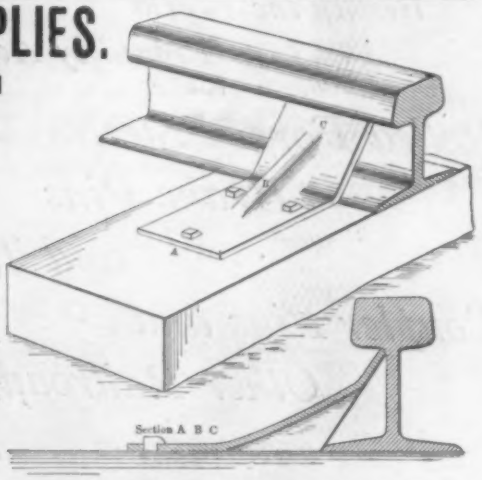

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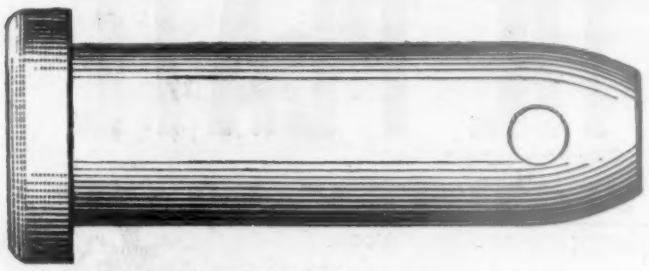

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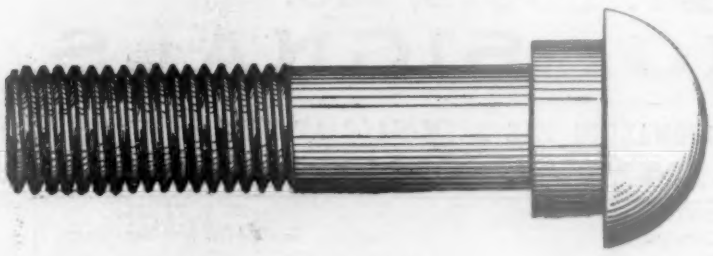

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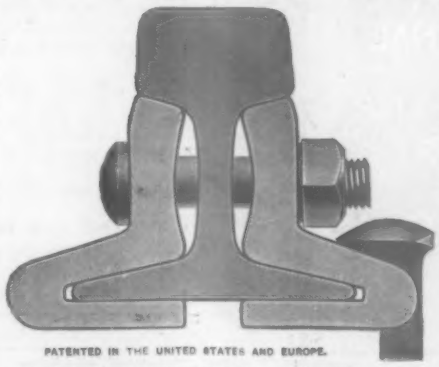

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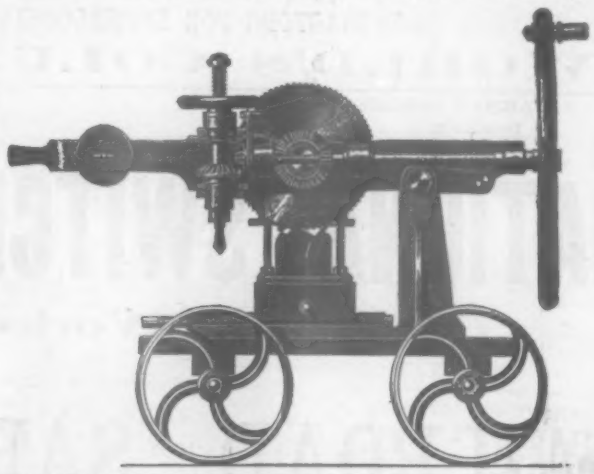

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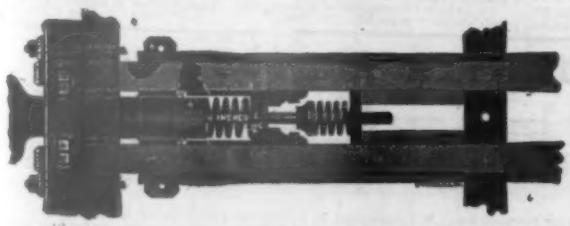

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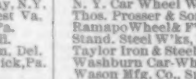
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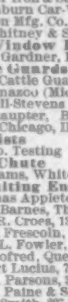

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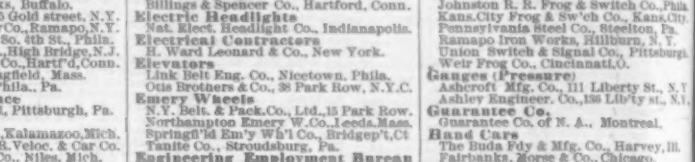

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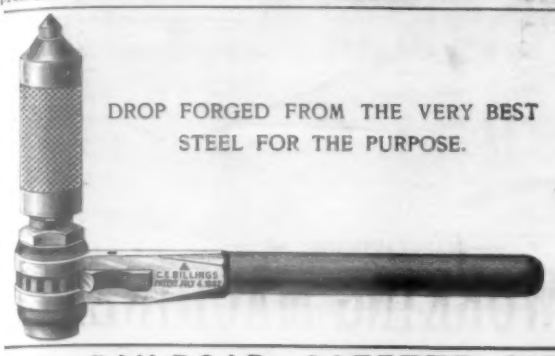

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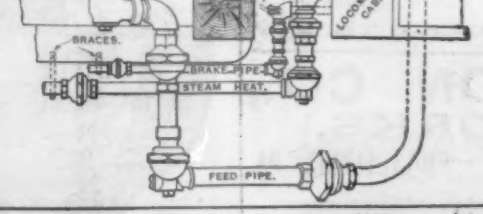

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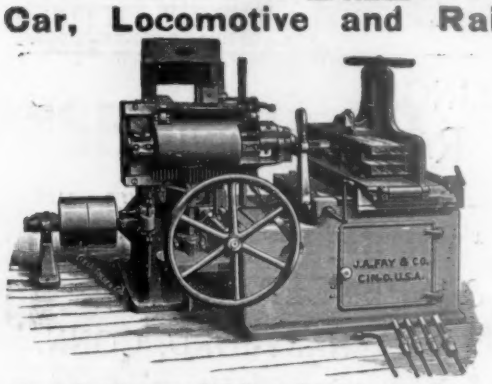

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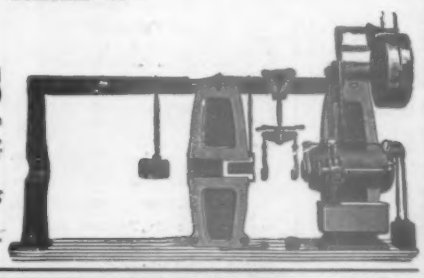

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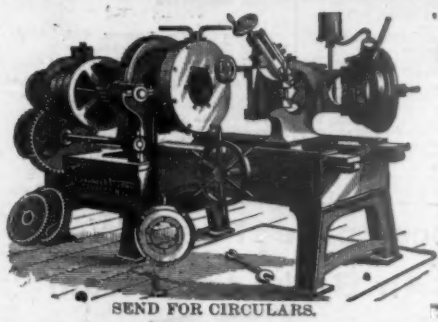

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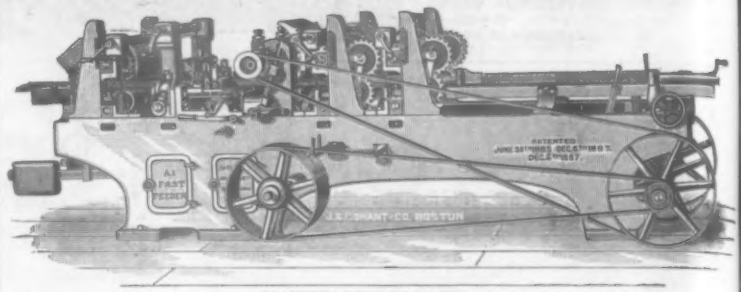

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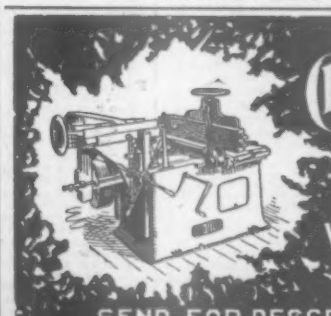

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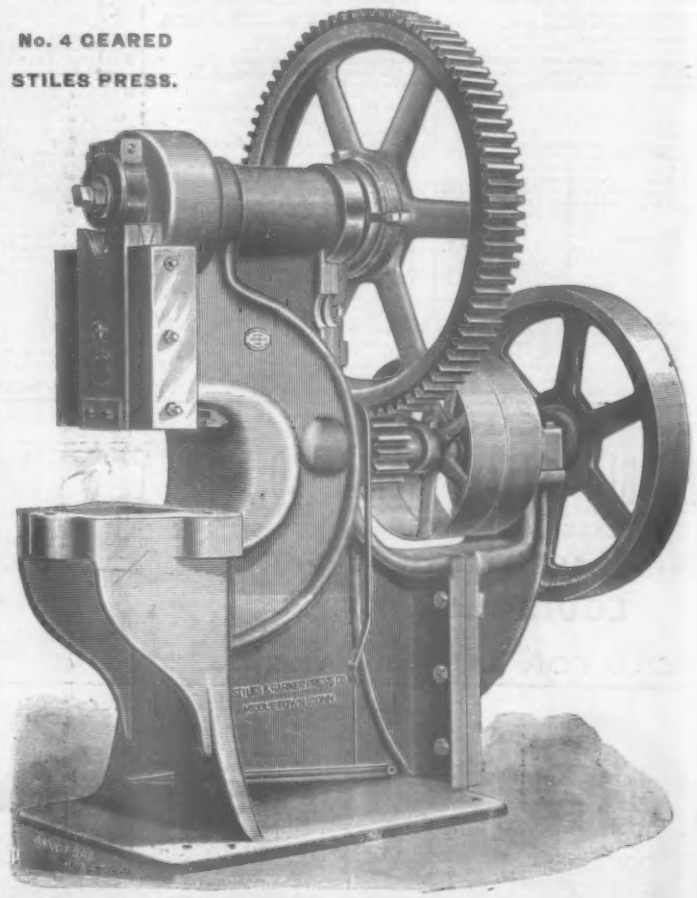

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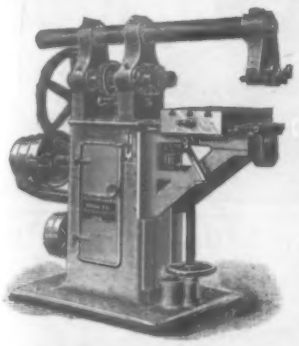

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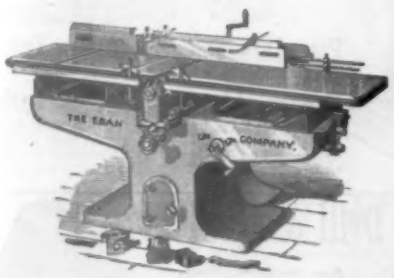

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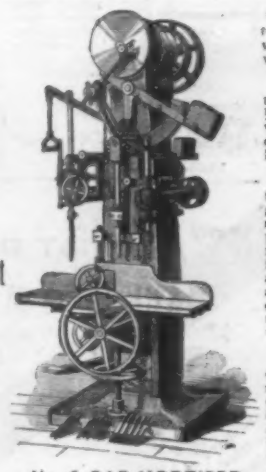

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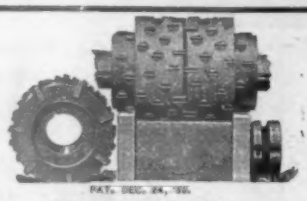

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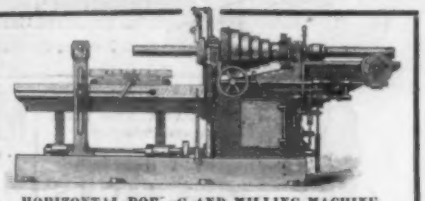

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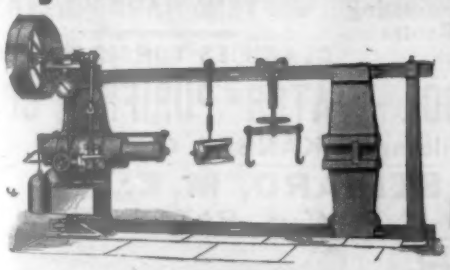

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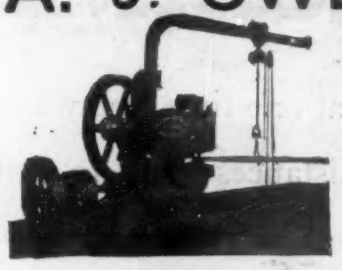

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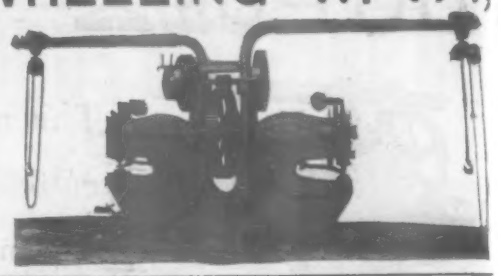

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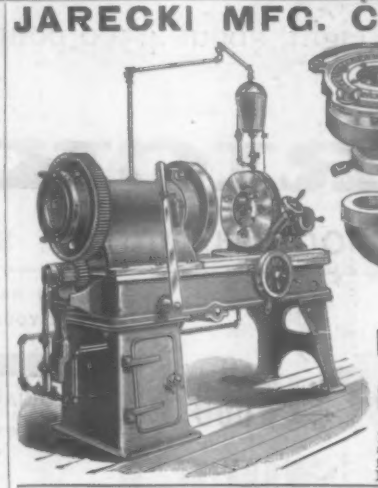

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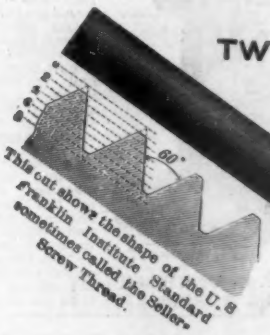

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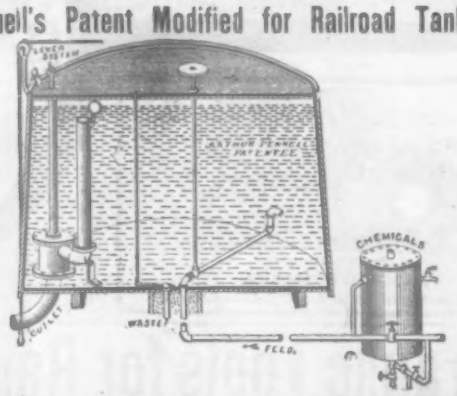

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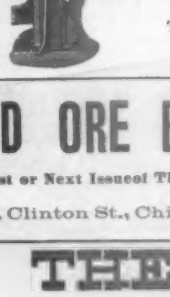

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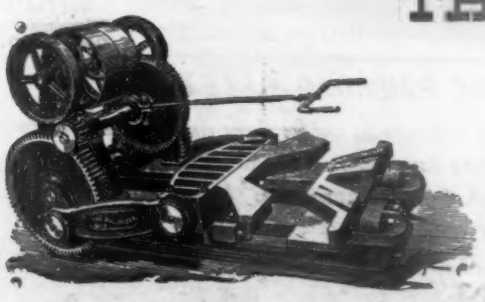

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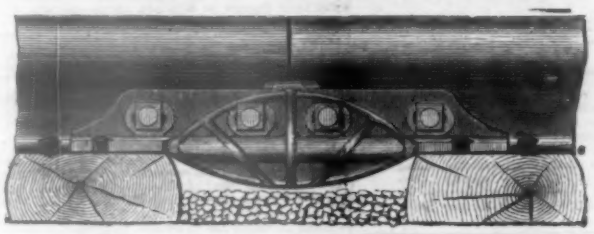

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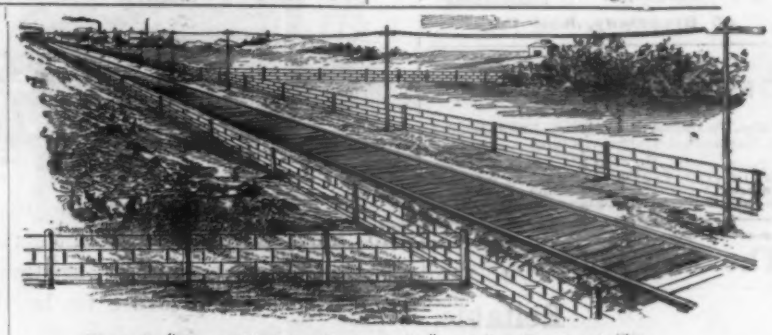

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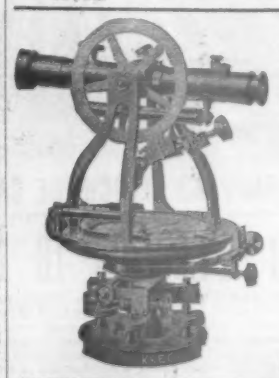

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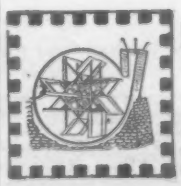

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N. Y. Supreme Court, Dutchess County.

LEWIS H. VAIL, as trustee for the holders of the first-mortgage bonds of the Poughkeepsie, Hartford & Boston Railroad Company, *Plaintiff.*

Against

THE POUGHKEEPSIE, HARTFORD & BOSTON RAILROAD COMPANY, Edward Elsworth, individually and as mortgagee in a certain mortgage deed recorded in the office of the Clerk of the County of Dutchess, in Liber 156, pages 213, etc., of mortgages, and as trustee under such mortgage deed, and others, *Defendants.*

Pursuant to a judgment of foreclosure and sale granted on the 6th day of February, 1886, and entered in the Dutchess County Clerk's office in an action wherein John P. Adriance, as Trustee, etc., was plaintiff and the Poughkeepsie, Hartford & Boston Railroad Company and others were defendants (the said John P. Adriance having died and the said Lewis H. Vail having been substituted as Trustee and Plaintiff in said action), I, the undersigned, the Referee appointed by the said judgment for that purpose, will sell, at public auction at the east front door of the Court House in the City of Poughkeepsie, Dutchess County, New York, on Thursday, the 26th day of January, 1893, at twelve o'clock noon, the premises described in said judgment and in the mortgage therein referred to, and which are therein described as follows:

"All and singular, the railroad of the said Poughkeepsie, Hartford & Boston Railroad Company" (now known as the New York & Massachusetts Railway), "now or hereafter to be constructed, being about 47 miles long and extending from the Hudson River at the City of Poughkeepsie through, or as near as practicable, to the Villages of Salt Point, Stanfordville, Stissing and Pine Plains, in Dutchess County, and Boston Corners, in Columbia County, New York, to a point in the line between the States of New York and Connecticut, near the village of Millerton, in the State of New York, the said railroad connecting at that point with the Connecticut Western Railroad, together with all and singular the franchises of the said Poughkeepsie, Hartford and Boston Railroad Company, and its equipments property, tolls, rents, issues and profits, its lands, tenements, buildings, fixtures, machinery, rolling stock, goods and chattels connected with the operating of the said railroad, or appurtenant thereto, and all rails, ties, fencing and erections, right of way and easements, including all property, real and personal, now or hereafter to be acquired by the said Poughkeepsie, Hartford & Boston Railroad Company, either in law or equity, of what kind soever purtenant thereto.

"Excepting and reserving out of the above described premises and property that part thereof lying between Boston Corners and state line, a particular description of which is contained in a deed thereof made by Abram J. Rose, Referee to the Hartford & Connecticut Western Railroad Co., dated 1st of April, 1884, and recorded in the Dutchess County Clerk's office in Liber of Deeds 216, pages 408, etc., on the 5th day of April, 1884, and also recorded in the Columbia County Clerk's office in Liber of Deeds 76, pages 258, etc., on the 9th day of April, 1884, to which deed and the records thereof reference is made.

"The premises hereinbefore described include and this decree is against those certain lots and parcels of land described as follows:

All that land in the town of Stanford, Dutchess County, and in North Hamilton street, in the City of Poughkeepsie, mentioned and described in a declaration of trust made by George Innis to the Poughkeepsie & Eastern Railroad Company, and dated August 14, 1871, and recorded in the Dutchess County Clerk's office in Liber 176, page 568, of Deeds.

"Also all that land in said City of Poughkeepsie lying south of Oakley Street, which was conveyed to George Innis by the Poughkeepsie, Hartford & Boston Railroad Company by deed dated July 15, 1875, which is recorded in the office of the Dutchess County Clerk, in Liber 181 of Deeds, page 95."

Pursuant to the decree aforesaid all said mortgaged premises will be sold by me in one parcel.

ABRAM J. ROSE, *Referee.*

Dated Dec. 6 1892.

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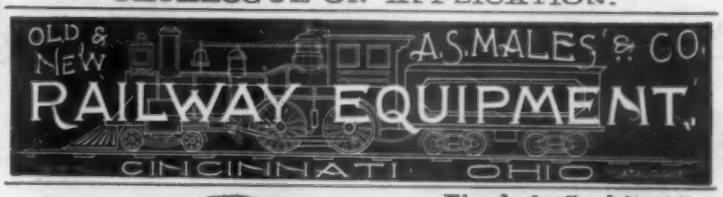

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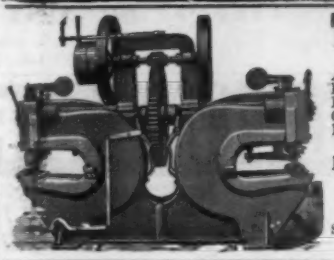

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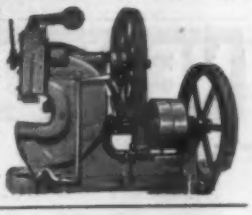

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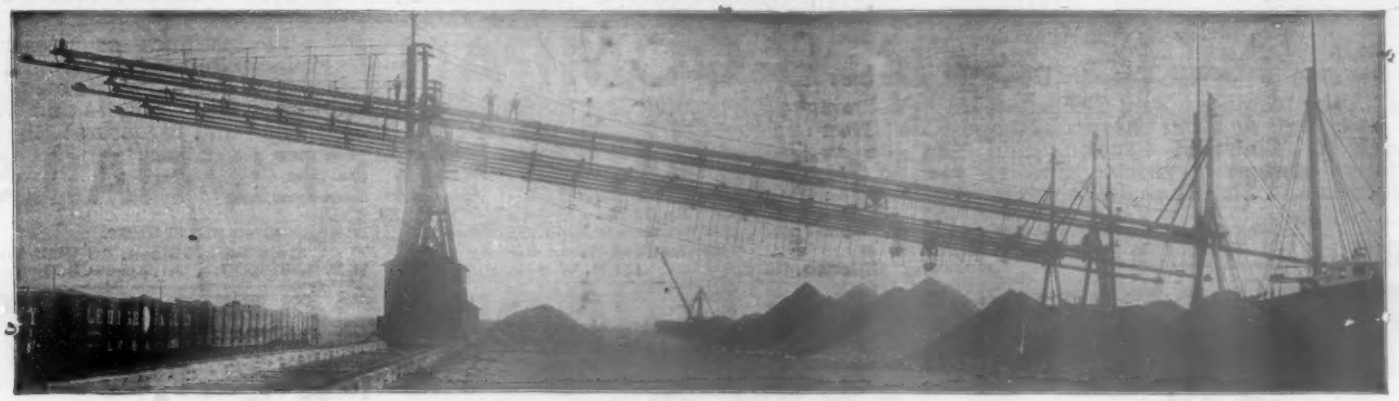

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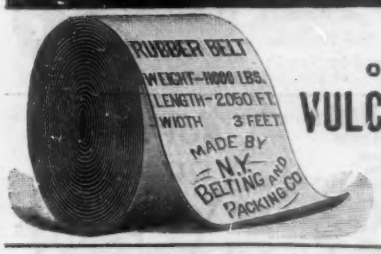

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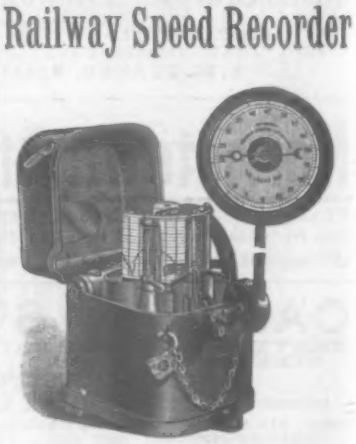

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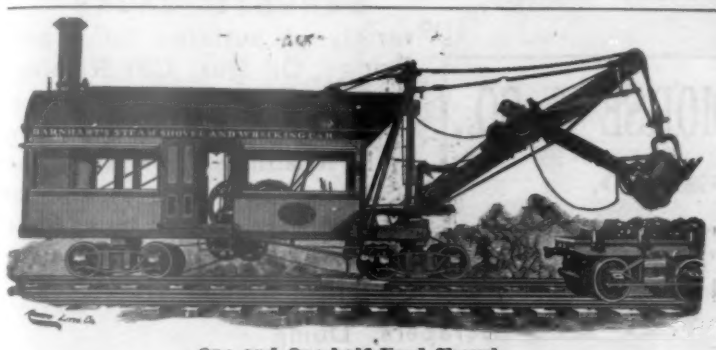

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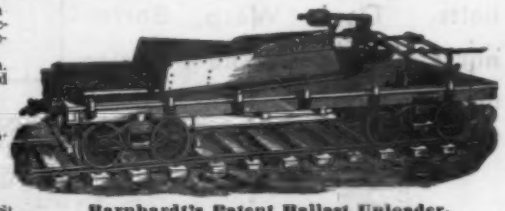

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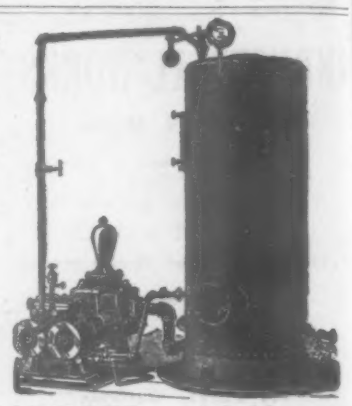

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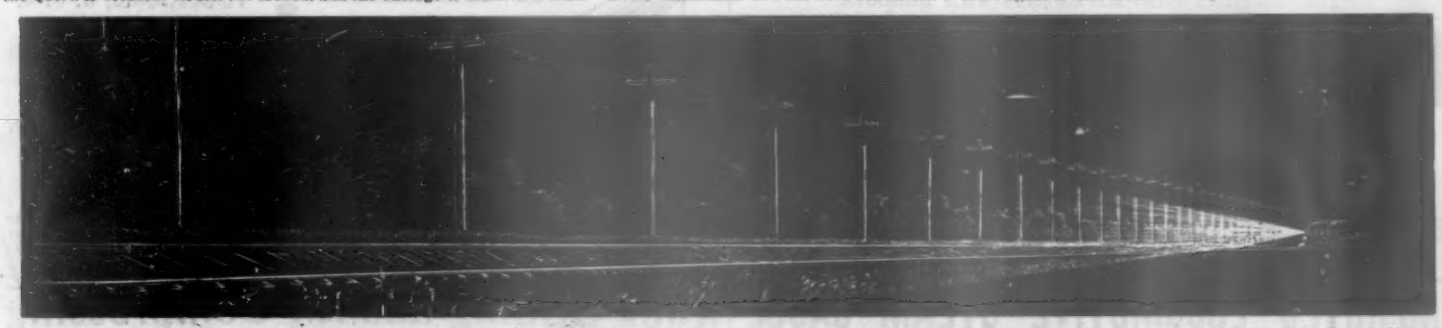

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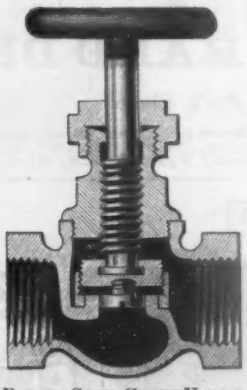

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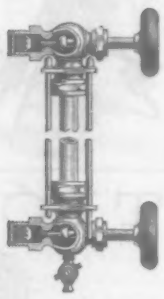

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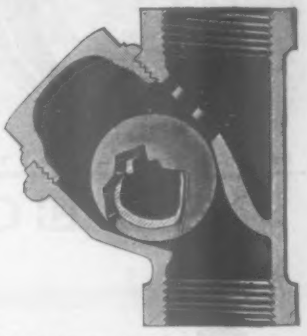

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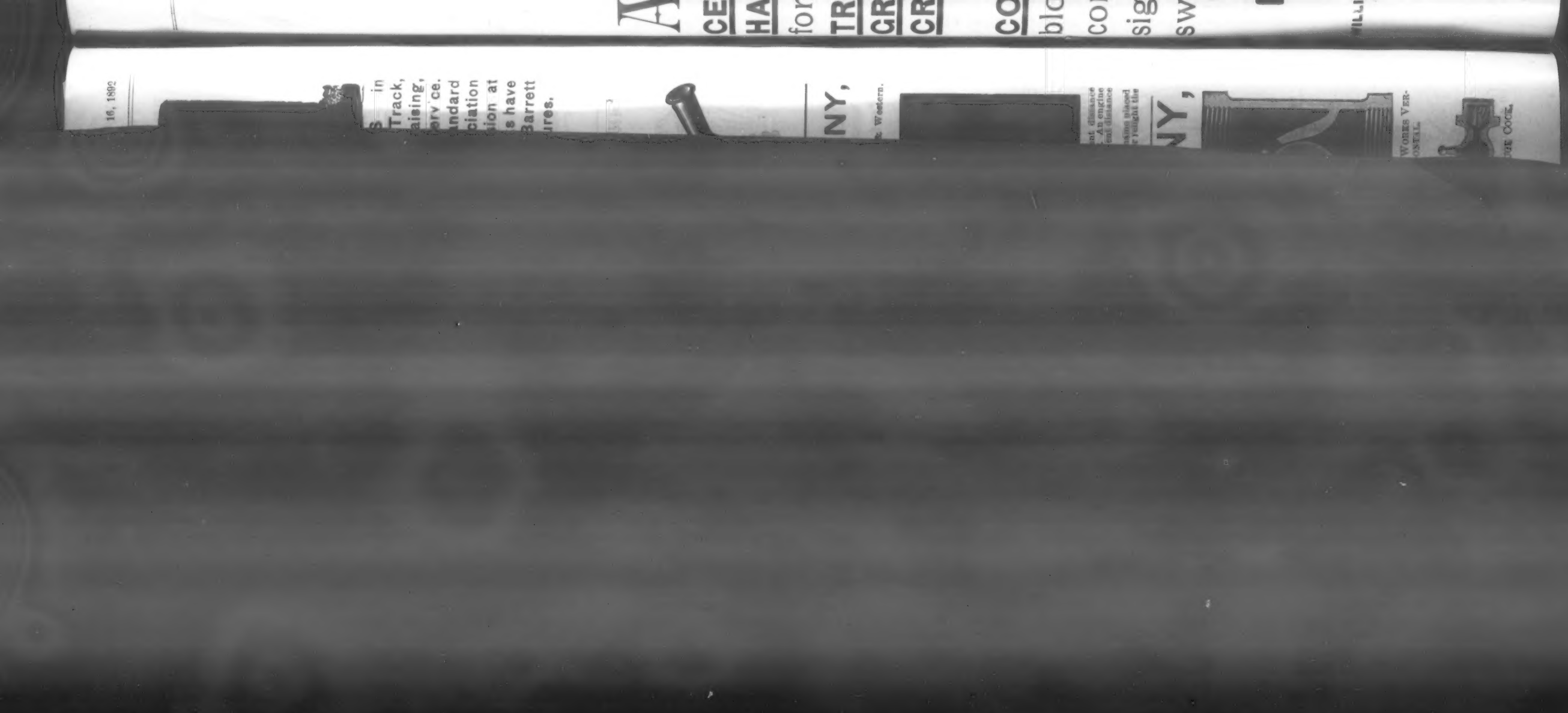

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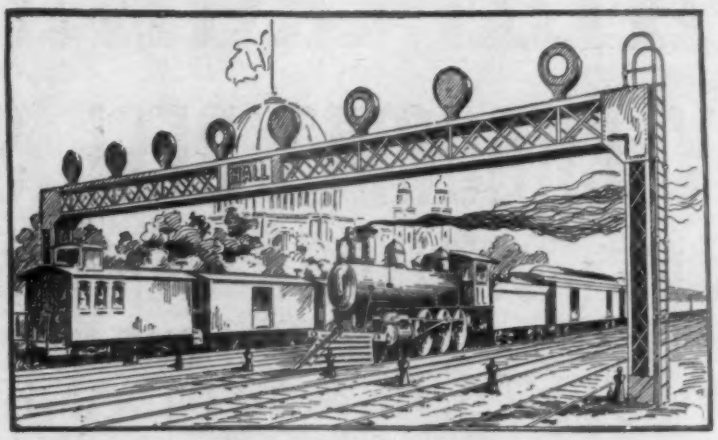

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KINSMAN BLOCK SYSTEM COMPANY

CENTRAL BUILDING,

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"IT IS A FACT THAT A SIGNAL WILL NOT OF ITSELF STOP A TRAIN; IT MUST BE OBSERVED AND OBEYED; PER CONTRA, A SIGNAL NOT GIVEN, OR A SIGNAL OBSCURED BY FOG OR OTHER CAUSES, LEAVES THE MOST CAREFUL ENGINEER IN AN UTTERLY UNPROTECTED POSITION."

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WE DO FOR THE ENGINEER WHAT THE AIR-BRAKE DID FOR THE BRAKEMAN.

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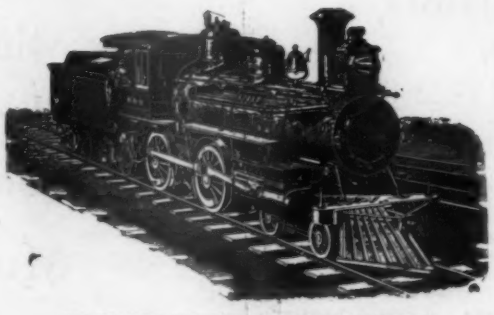
This device will not successfully handle **all waters,** but there are **none** that it will not improve. In a **large majority** it will demonstrate great economy.

The apparatus can be made at railroad shops at small expense.

A trial is solicited at our expense.



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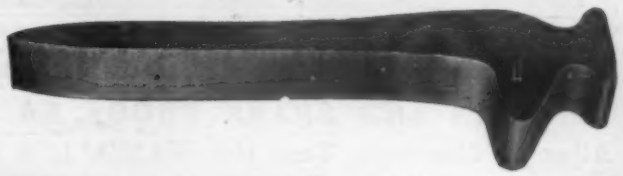

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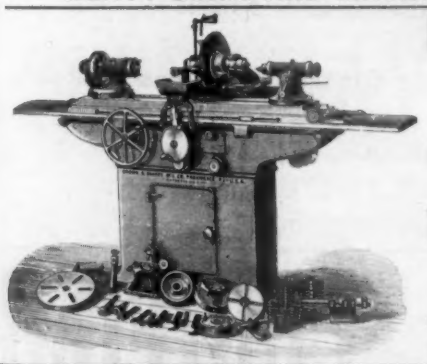

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RAILROAD GAZETTE

FRIDAY, DEC. 16, 1892.

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American Railway Association and Safety Appliances.

RICHMOND, Va., Dec. 10, 1892.

TO THE EDITOR OF THE RAILROAD GAZETTE:

"The committee could do some good work by making a few vigorous reports." (See *Railroad Gazette*, Oct. 14, 1892.)

This sentence caught my eye at the time it appeared, but I preferred to await the publication of the American Association proceedings before saying anything in reply. I am an original subscriber to the *Railroad Gazette*. It is usually accurate, usually just. In the present instance I protest that it is neither, and I care enough for its good opinion to feel aggrieved.

The Committee on Safety Appliances has reported distinctly and emphatically in favor of "safety" couplers and air brakes on freight trains and locomotives. Its reports have been approved and adopted. The language of these reports does not, in the eyes of the *Railroad Gazette* seem to have been well chosen; the effect, nevertheless, ought to go far to satisfy even the most "vigorous" of your able staff. Permit me to refer you in proof of this to the recent report of the Committee. I quote:

"These figures show an exceedingly gratifying growth in the equipment of cars with automatic couplers since Feb. 15 of the present year, when information was obtained from 100 of your members on the same subject. At that time out of 703,825 freight cars owned by your members 118,406 (or 16.8 per cent.) were equipped with automatic couplers. On Oct. 1, 1892, out of 882,751 cars reported, 200,753 (or 22.6 per cent.) were equipped with automatic couplers. As compared with the ratio of Feb. 15, this is an increase in rate of 34 per cent. No attempt was made to obtain this information from transportation companies. On Feb. 1, these companies owned 17,700 cars, which were equipped with automatic couplers, and adding these to the total as above obtained, it appears that not less than 218,453 freight cars were equipped with automatic couplers on Oct. 1, 1892. When the 9,799 cars to be so equipped and now in course of construction are completed, the total will be 228,252.

"Of new cars ordered 85.3 per cent. are to be supplied with automatic couplers. That is to say, out of 11,484 cars being built 1,685 are to be without automatic couplers.

"On Feb. 15, 1892, there was 88,107 freight cars equipped with air brakes out of 703,825 reported, or 12½ per cent.

"On Oct. 1, 1892, there were 144,981 freight cars equipped with air brakes out of 885,751, or 16.3 per cent. Out of 11,858 cars now being built 7,934 or 69.1 per cent., are to be equipped with air brakes. On Oct. 1, 1892, out of 26,080 engines reported 20,988, or 80.5 per cent., were equipped with power brakes, and of all the engines now being built only three companies of those reporting are building them without power brakes."

Progress, not so marked, but by no means unsatisfactory, has followed the Committee's report (and its adoption) in favor of steam-heating cars.

The Committee, together with the Train Rule Committee, has more recently taken up "Block Signaling." It feels that it has entered upon a wide field, in scrutinizing which great circumspection is demanded. Having at its command, perhaps, better sources of information than others, and correspondingly impressed with a sense of its responsibility, its course must be deliberate and its recomendations very carefully and cautiously weighed. Its outgivings ought to be well matured, supported upon well-ascertained and well-digested data. Patience, time and labor it will cheerfully bestow upon the task allotted to it; but those who are engaged in it are busy men with a great deal of other work in hand. There should exist no desire to goad them into hasty conclusions, and chidings can have no good effect upon them.

You should not be unmindful that this is not like the codification of old rules or the devising of new ones (which have both been so thoroughly accomplished) a matter which demands little if any outlay of money. Large expenditure is now involved both in the adoption of signal appliances and the change from those already established to other methods, and in consideration of this we are to act. We will endeavor to perform our duty in due time.

E. T. D. MYERS,
Chairman Committee on Safety Appliances.

[We do not believe that any one has appreciated more, or commended oftener, the very valuable work of the American Railway Association than the *Railroad Gazette*. We suggest that Major Myers is technically "accurate" but actually "unjust" to take one sentence out of our editorial and be aggrieved about it. We admit that the sentence expressed our meaning imperfectly, but read with the context, and especially with the article of the preceding week, the meaning seems tolerably clear. We neither implied nor intended to imply that the reports heretofore made by any committee were other than vigorous. Our main idea was that an utterance from the joint committee, on the subject of signaling, would be valuable to the railroads, in spite of the fact that definite recommendations cannot be made.—EDITOR RAILROAD GAZETTE.]

The Professional Status of the Engineer in America.

NEW YORK, Dec. 10, 1892.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Just at this time there appears to be an unusual outcropping of the latent feeling among engineers that all is not right with their profession, both within and without; that is to say, a very considerable amount of writing has recently appeared directed to various aspects of the engineer as he now stands revealed to his fellows and concealed or obscured from the full view of the body politic, and calling for some formal establishing of a profession, which in America now stands upon the broad principle of "the devil take the hindmost." So far it is just what its members make of it from day to day without a conservative quality of its own, and it may even be said that in the organized sense in which people speak of the other learned professions it is not a profession at all, but an inchoate body without the power of propulsion; and yet its individual members have always been found among the human prime movers of the world.

It would seem as if it were high time for organization and as if the coming year might be propitious. The American engineers will greet at Chicago their visiting brethren from other lands where professionally as well as potentially the engineer is recognized, and they will have to pose, as it were, during the period of the Exposition as exponents of a similar condition on this side of the sea, which exists so far solely in their desires and their higher aspirations. The hour is here, but is the man, or, to be more literal, are the men?

Without entering at length into the arguments for solidarity among engineers, arguments which would apply equally to practitioners of the law and of medicine if they happened, in a comparatively new and uncivalized country, to be unorganized, it may be interesting to draw attention to the forms in which the recent movement is manifesting itself.

First of all, there is the sentimental, or what may be termed the post-prandial, manifestation of a growing desire for an enduring bond that shall unite, on a common ground before their fellow men, the practitioners in the many widening fields. There is more in this view than may at first appear, and it is a significant fact that not until recently has there ever been opportunity for the cultivation of such a sentiment in any public way. Of this form of solidarity the Engineers' Club is the prophet.

Secondly, we have the educational manifestation by which the general public is to be, or perhaps is being, very slowly educated up to the distinctions of the profession of the engineer. The *Engineering Record*, not long ago, in a series of articles and letters extending over many weeks on the general subject of the reciprocal relations of the public, and the engineer testified to the process of this development, as well as the comparative advance.

Thirdly, we have the ethical manifestation. The *Engineering News* quite recently has essayed the task of reprimanding the followers of engineering for various reprehensible practices unworthy of an honest, not to say a noble, profession, and although, perhaps, too sweeping in its charges and too prone to make extreme cases typical, and silent as to the sin of professional advertising, joins its testimony to the general concensus that organization is sadly needed by engineers for protection, speaking collectively, against themselves.

Fourthly, we have the trades-unionists, who see standing out most conspicuously the necessity of removing the quack and having the thieves fall out (of the profession) in order that they, the honest men, may get their legitimate dues and fees. There is a good deal in this view too, just as there is in the aspect that comes out brightly in the after-dinner glow of good fellowship, and perhaps, if the truth were known, it is to this consideration mostly that the movement will owe its support.

Fifthly, we have the territorialists, who would like to have engineers inserted in the McKinley bill with a very high specific duty; but, fortunately, this principle, which, if universally applied, would narrow the field of the American engineer unendurably, has not prevailed, nor is it likely to. Like art, engineering science knows no country, nor does the profession need protection of this description, nor can it afford to be hampered with it. Still, notwithstanding the futility of such restrictions, the advocates of union on a territorial basis bring strong arguments to bear in support of their view, and one of the ablest and fairest statements of the question is to be found in a very instructive paper recently read before the Canadian Society of Civil Engineers, and published in its *Transactions*, entitled. "A Plea for a Close Corporation," by Mr. Alan Macdougall. After reviewing the historic advancement of the engineer in Great Britain, tracing its connection to the efforts of the Institution of Civil Engineers, and entering with some elaboration into details not directly connected with his plea, though closely allied to it. Mr. Macdougall sums up in support of his contention for professional qualifications as follows, and his brethren on this side of the geographical line which at present separates the Dominion from us will admit that if the provincial utterances be eliminated the conditions are fairly stated for the United States as well.

The unexpressed desire, one may almost say will, of the profession is toward higher attainments in its members, and the recognition of them by a properly constituted professional body. Universities and colleges may grant degrees in arts, medicine or law, the holder of a degree obtains no professional advantage until he is admitted to professional standing by a corporate body duly qualified and entitled to do so. The feeling has grown rapidly in the Dominion in the last five years that professional standing must be recognized, and a qualification obtained whereby a man's standing can be established. The architects of the provinces of Quebec and Ontario have organized; in British Columbia a movement for organization is on foot; the provincial land surveyors of the Province of Ontario have had increased power granted to them by legislation and they are now endeavoring to get a charter to enable them as a body to license their practitioners, instead of being licensed by the government.

The formation of a close profession will not be injurious to the engineering interests, or to the public. It is not yet 25 years since the medical profession in the Province of Ontario, obtained a charter; no injury has arisen to the public from the formation of this into a profession; it would take only a few minutes to satisfy any sceptic that the movement has been of the greatest benefit to everybody. The several provinces have each their law societies, they are all close corporations. Who ever heard of importing leading counsel from the United States to plead a cause in any Canadian court? Who has suffered in any way from this arrangement? Can anyone say that the cause of justice is badly served because the members of the Canadian bar do not practice in the United States courts? Does public health suffer because American physicians do not have branch offices in Canada? Who can say that these distinctive cordons have provoked bad feeling between the respective professions in each of these two countries? On the contrary we know that the very best and friendly relations exist between these professions. The formation of these professions into such close corporations has been attended with the very best results to every one, of inestimable benefit in elevating the morale of the practitioners, the movement has resulted in incalculable benefit to the public.

The writer has good grounds for saying that there is a strong feeling in the profession for closer union; if a poll were tried the favorable expression of opinion would be surprising. Nothing can be more unsatisfactory than the present professional status, in no class of men calling themselves a profession of learned men is their so little of self-respect, dignity, and *entente cordiale*. Physicians are generally credited with having less brotherly love toward each other than any other profession; still with it all one member does not try to cut into his neighbor's practice, take patients away from him or offer to perform operations at a lower rate. Barristers or solicitors do not fight for clients nor do counsel tender to take briefs for the pleasure of cutting out a neighbor. What does the engineer do? Who can deny that there is about as much wire pulling and log rolling among engineers as among the vendors of patent articles; corporations all know it and make full use of it; they either make engineers bid directly against each other, get advice for nothing through the public press, or set them to work directly, and indirectly to cut each other's fees. As the profession stands to day, it is almost a trade; men advertise themselves either in the public press or by circular, or by flooding the country with copies of every report they write, they have themselves interviewed and described as "eminent," "well known," "experts," etc., and yet condescend to practices which these very words reprobate. The Institution of Civil Engineers says that "membership in the Institution is a real guarantee of professional standing and (so far as possible) also of the personal character of those on whom it is conferred." Membership in our Society also, as well as the kindred one in the United States, should be taken to have a like influence and value, which should exert a much more elevating tone and effect on the members than it appears to do.

The profession in the British Empire is certainly influenced by the Institution, membership in it carries weight all over the Empire and on the Continent of Europe. The writer notices with satisfaction that of late years Canadian engineers have felt the benefit of connection with the Institution. Next to the Institution the American Society has claimed and still attracts many Canadian engineers; the qualifications for this society are of such an order as to give its members a standard similar to that of the Institution. The effect of membership in one or both of these societies has not had the improving and high moral tone on the Canadian members it seems to have on members resident in the United States and elsewhere, so far as the writer's experience extends. There is too much advertising,

puffing, still hunting and conduct which connection with one of these societies alone should lead a man to abhor, how much more then should his self respect rise if he belongs to more than one? The medical profession in Ontario set a very good example when they wisely and properly decided against advertising; they do not even allow the insertion of a professional card in any newspaper.

In the legal profession, the system of advertising exists to a limited extent, chiefly in the form of professional cards. In the practice of both these professions one finds no tenders asked for surgical operations or family practice, nor do learned counsel cut fees or swagger over their cases won.

Finally, we have the specialists in each ramification and expansion of engineering science, whose standpoint can be best set forth by quoting from a published account of the recent meeting of the American Society of Mechanical Engineers.

The gist of the argument was that the standing of the profession with the public is seriously injured by the fact that any one who chooses can assume the title or degree of an engineer. The blunders and rascality of those who assume the title with neither ability nor character cause people to look with distrust upon the work of all engineers. To remedy this state of affairs Mr. Porter proposed that the profession should undertake the task of deciding who may and who may not assume the title of engineer and suggested a classification of the whole engineering field into the following nine divisions: mining, metallurgical, manufacturing, static, dynamic, land, hydraulic, aerial, military. An engineer would be required to obtain a license, or testimonial of proficiency from a "Boad of Regents" prior to practice in each of these departments. Standard fees should be agreed on and thus "the large body of licensed specialists would be able to obtain a living while the incompetent could not thrive."

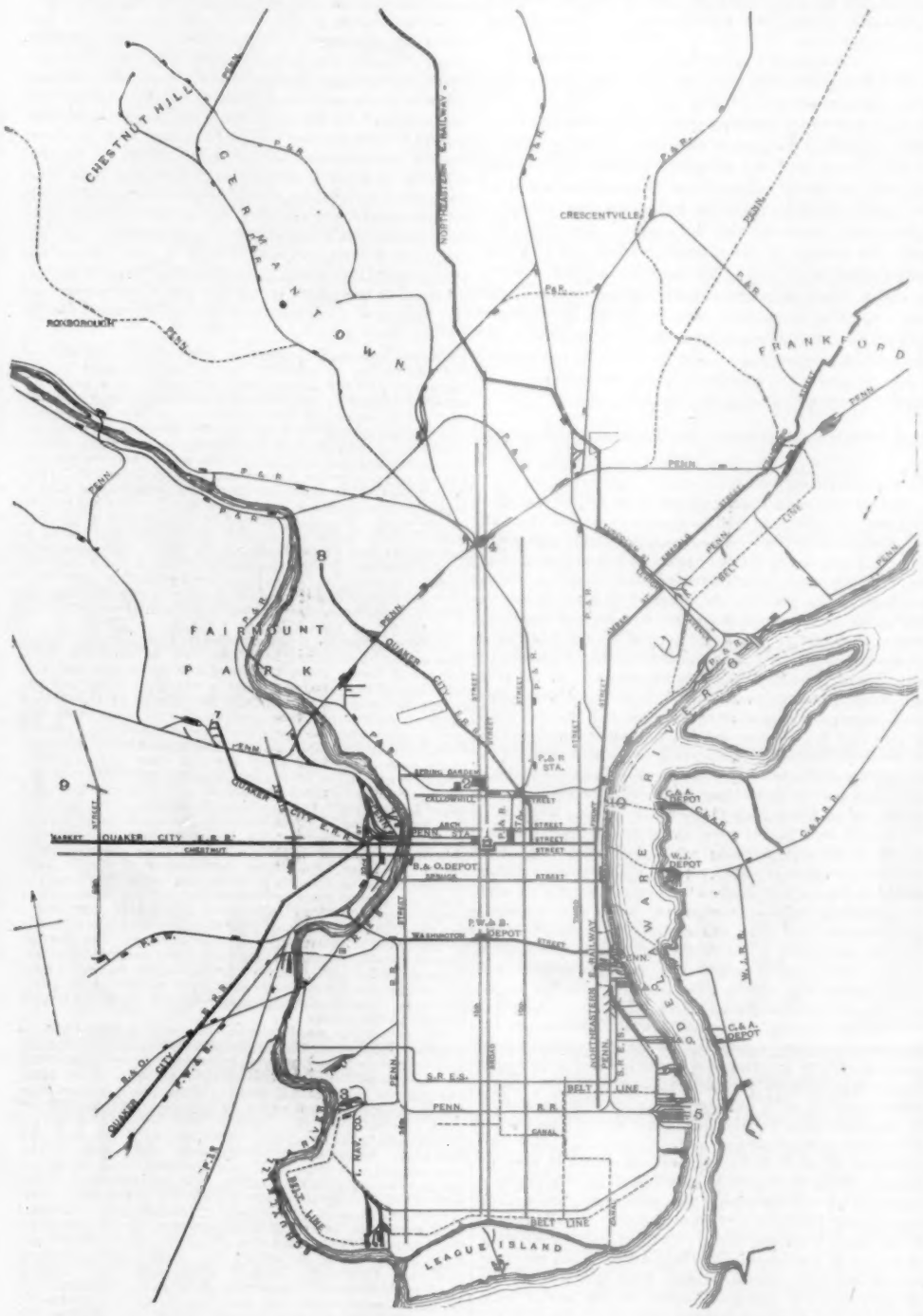
But Mr. Porter did not state how the "profession" could be first organized so as to be competent to perform the pruning process; obviously, the end in view is coexistent with the beginning. But it is only fair to note that he "wound up by saying that his remarks were simply offered to induce discussion."

The problem is many sided and difficult, but probably it is nearer solution now than it has ever been and certainly there is encouragement in the wide-spread interest that attaches to it. It is no longer a question of expediency, but of ways and means.

When we picture a close corporation which is to be ennobled by its members as well as sustained, and which in turn is to elevate and honor them, we must eliminate the selfish aspect and consider only those features of organization which sink the individual and exalt the type. Of course, the whole attempt is collectively not disinterested, nor is it a charitable or a beneficent undertaking. Emulation and strife must go on within its lines, and the individual will always be struggling for supremacy; but so far as the action of the profession collectively extends, it must be with the clearly defined and unassailable motive of the advancement of the whole body, or it will assuredly and inherently fail. Its members must be classified, but on the basis of merit and attained skill, and not according to a particular school or vocation. The profession must be, in most respects, as broad as the broadest of the three great engineering societies, by which are meant the American Society of Civil Engineers, the American Society of Mechanical Engineers and the Institute of Mining Engineers. In this enumeration there is no intention of exclusion of the representation of several other societies and associations throughout the country, but it is assumed that the field covered by these three is wide enough to include all *engineers*, no matter what their specialties may be. But, while broader than each, it must be, in at least one respect, narrower than they all are collectively, for it is interesting to note that, while each recognizes a standard of qualification for admission, it prescribes none for behavior—and, not to put too fine a point on it, the latter is greatly needed.

It is to the lasting credit of engineers as a class that they have got along at all without a code. But a code is worse than useless without power to enforce it; and therefore, before we can have a code, speaking now only of the United States, we must obtain a professional status in law.

Each of the three societies may make up its mind (and probably it has already done so) that the other two are here to stay and be thankful that this is so. On the other hand, there seems no probability of coalition and that is not to be deplored for the competition is healthful and mutually beneficial. But there is a common object for all in the elevation and the establishment of the profession at large, and it lies within their power collectively to accomplish it. FOSTER CROWELL.



1. City Hall.
2. Baldwin Locomotive Works.
3. Point Breeze.
4. Germantown Junction.
5. Coal Pier Pennsylvania Railroad.
6. Port Richmond.
7. Elm Avenue Station.
8. Laurel Hill Cemetery.
9. Haddington.

Proposed Elevated Railroads in Philadelphia.

NOTE.—*Heavy lines show the Quaker City and the Northeastern Elevated railroads.*

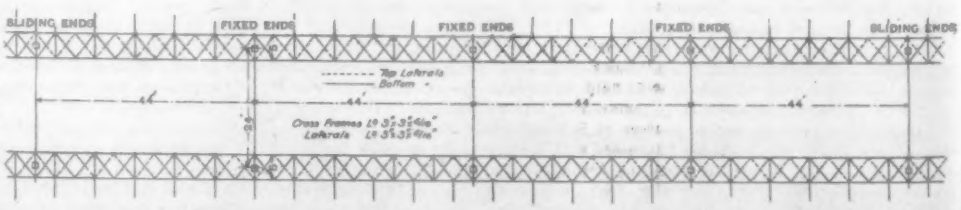
The Quaker City Elevated Railroad.

The Quaker City Elevated Railroad Co. has secured charters and all the necessary ordinances from the city of Philadelphia for the lines of elevated railroad which are shown on the accompanying map, and the company expects to get to work as soon as the litigation concerning right of way is settled. There is excellent reason to believe that the line of the Quaker City Elevated from Front street west through Market street and along Lancaster avenue to Fairmount Park will be completed within two years. The map which we give is merely an outline as it was necessary to omit most of the streets in order to avoid confusion. Enough of the principal streets are indicated, however, to enable one acquainted with the geography of Philadelphia to get a good notion of the routes of the Quaker City and the Northeastern lines. From Market Street Ferry the line of the Northeastern Elevated extends north and northeast to Frankford and Tacony and also south along Front street. A branch of this line to the northeast leads to Coopersville and Jenkintown. The line of the Quaker City Elevated extends west along Market street to Haddington, with two branches toward the northwest, one along Ridge avenue to Laurel Hill Cemetery and the northern line of Fairmount Park (8) and the other to the southern line of Fairmount Park on Elm avenue (7). The third branch is to the southwest along Woodland avenue and Darby road to the city line near the suburb of Darby.

The engravings of the structures require no comment. It will be seen that they are of the modern, plate girder type with some modifications for the different situations for which they are designed. For the drawings from which the engravings have been made, we are indebted to Mr. C. W. Buchholz, the President of the Quaker City Elevated Railroad Co. under whose charge the designs have been made.

The map also shows the new local branches of the Pennsylvania and the Philadelphia & Reading on the north and northeast of Philadelphia. The Pennsylvania is building three lines, the Roxborough branch, the Fort Washington branch and the Philadelphia & Bustleton. The Roxborough line extends from Chelton avenue station through Manayunk and Roxborough to a connection with the Trenton Cut-Off, near White Marsh. The grading and masonry work on the Fort Washington branch, extending from Allens Lane station, on the Chestnut Hill branch, to a connection with the Trenton Cut Off, near Fort Washington, is about completed, but the track will not be laid until Spring. The work on the Philadelphia & Bustleton line, extending from a point on the New York Division, near North Penn Junction, to Bustleton, is progressing slowly.

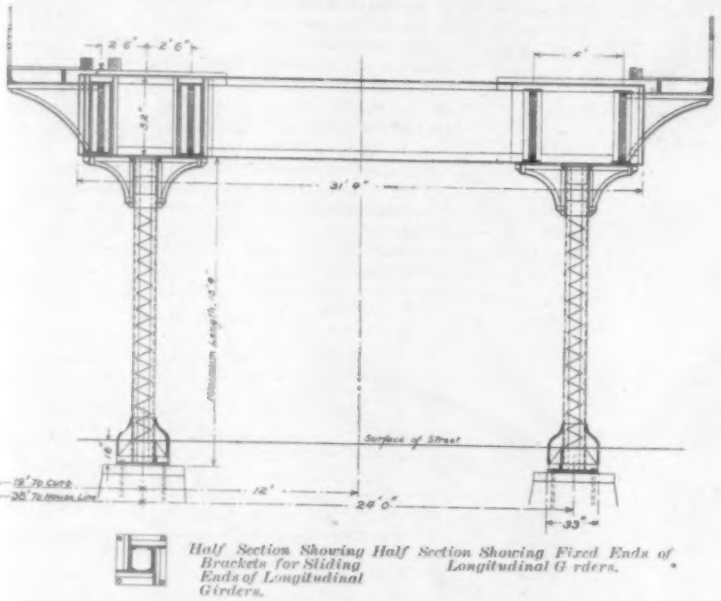
The Philadelphia & Reading is building a connecting line from a point near Tabor station to Olney station.



Sketch Showing Arrangement of Sliding and Fixed Ends and Lateral Bracing—Market Street.

one mile, and the Philadelphia & Frankford from Crescentville to Frankford, about three miles. Both lines will be completed next March.

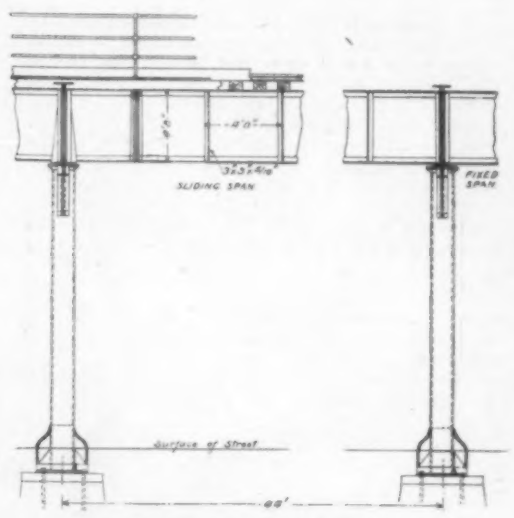
The route of the Philadelphia Belt Line is shown in dotted lines. The line is for freight traffic and is completed and in operation along Carbon street, from Allegheny avenue to Reynolds street, Bridesburg, and construction is going on north of that point to Tacony. The Belt Line will use the tracks of the Pennsylvania Railroad on Swanson street and Delaware avenue from Dickenson street to Callowhill street.



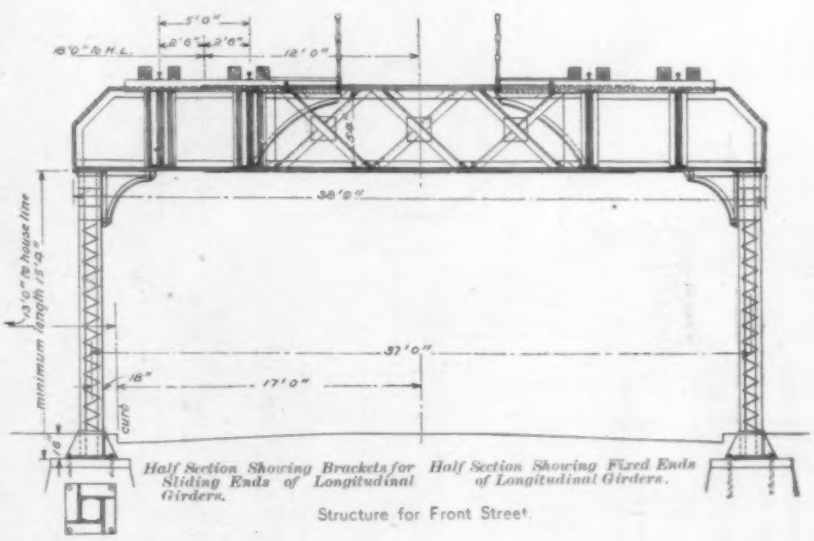
Half Section Showing Brackets for Sliding Ends of Longitudinal Girders.

Half Section Showing Fixed Ends of Longitudinal Girders.

Structure for Market Street



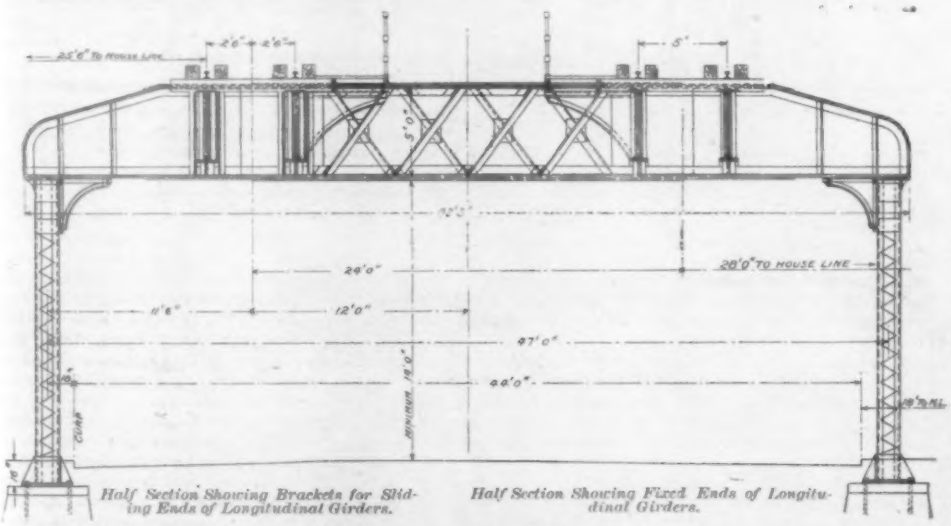
Side Elevation—Market Street.



Half Section Showing Brackets for Sliding Ends of Longitudinal Girders.

Half Section Showing Fixed Ends of Longitudinal Girders.

Structure for Front Street.



Half Section Showing Brackets for Sliding Ends of Longitudinal Girders.

Half Section Showing Fixed Ends of Longitudinal Girders.

Structure for Lancaster Avenue.

DESIGNS OF STRUCTURE FOR THE QUAKER CITY ELEVATED RAILROAD—PHILADELPHIA.

Side Elevation—Lancaster Avenue.

The Qualifications of a Claim Agent.*

. . . Formerly railroads ran along as best they could without this important adjunct to their staff. The division superintendent, who as a rule was well equipped for the discharge of the duties which legitimately belonged to his department, but who was unfit to intelligently do the work of a claim agent, took charge of all claims, and frequently settled them according to his prejudice or feelings rather than from any knowledge of the case or its equities. . . . The antagonisms and prejudices resulting from this practice the claim agent of to-day has to contend with. While it is true that the former method of adjusting claims is not the only cause for the feeling against railroad companies, it is to a very large extent responsible for it, and whatever part of it is due to this cause can be eradicated only by treating all claimants fairly and honorably.

The Claim Agent should know no favorites. If a claim is just and a legal liability exists, compromise it if possible; if no liability, decline it. The position and duties of a claim agent should not be, as they frequently are, lightly considered by the general officers. He should not be regarded simply as a "handy man to have," to whom all matters that annoy and bother a superintendent can be referred. His duties should be clearly defined, and his authority fixed. He should be a person qualified to determine whether a claim presented is one for an adjustment or not, and if it is of that class of cases where the only question is one of amount, he should be authorized there and then to make, or attempt to make, a settlement and close the contract.

This leads to the question frequently asked, Should a claim agent be an attorney? Now, while there are many persons learned in the law who would not be at all qualified to fill the possition of claim agent, and many others who have never studied law at all make admirable ones, yet, as a rule, I should say that the general claim agent of a line should have a legal education, and his assistants should have a good knowledge of the principles of railroad law. Especially those assistants who take statements of witnesses should be well posted in the rules of evidence, so as to know, if the case comes to trial, what will and what will not be admissible testimony. You have all seen the voluminous statements taken by inexperienced persons in a personal injury or death case. How careful they will be to detail with minutest accuracy what was done with the person after the accident, or how satisfied the friends of the deceased were with the funeral arrangements made by the railroad company, and totally fail to give any testimony whatever as to the cause of the unfortunate accident, or any evidence tending to show whether there was or was not a legal liability on the part of the railroad company.

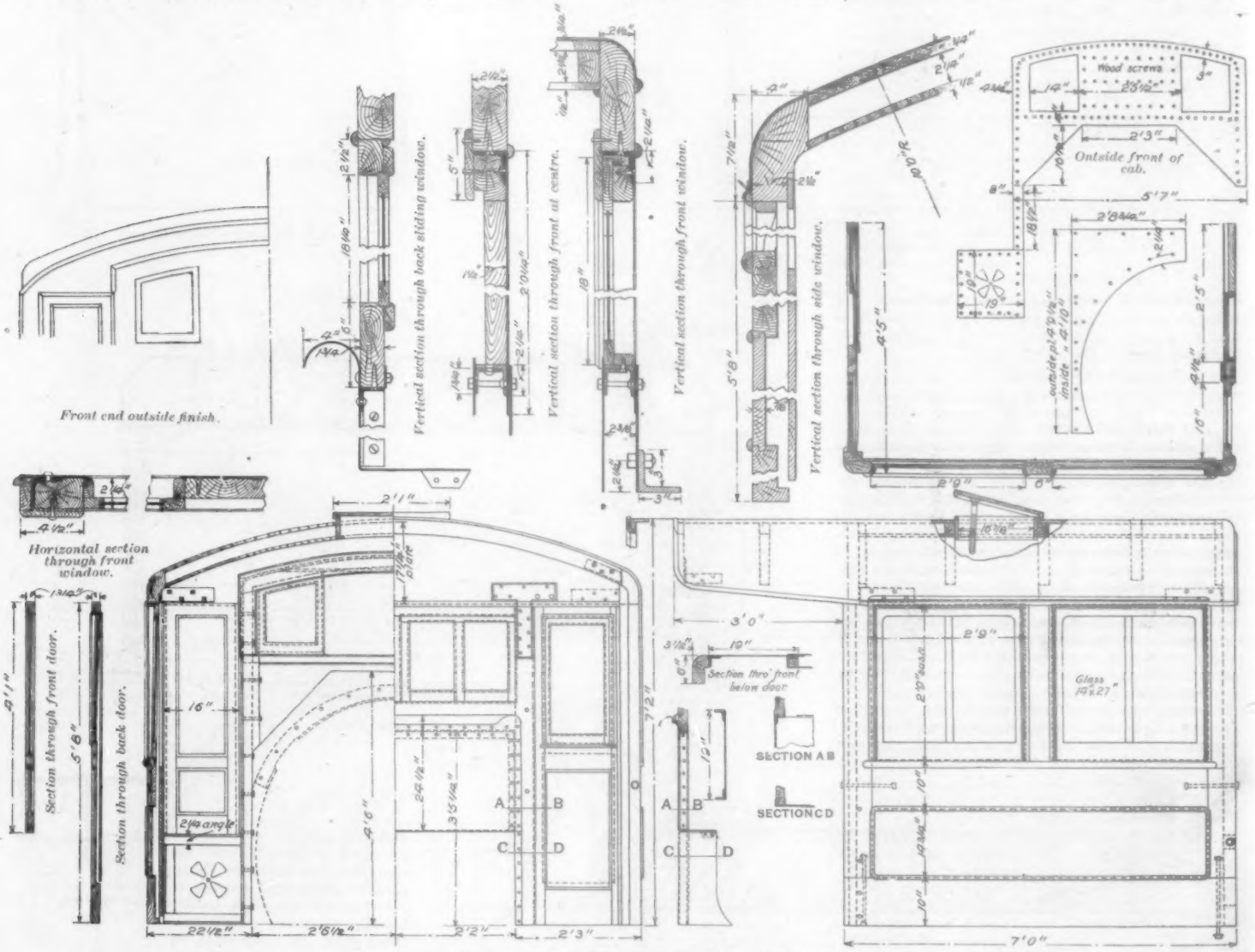
But the Claim Agent may have the legal knowledge of the most learned lawyer, the tact and skill of the diplomat, and the most liberal education and indefatigable energy; his position may be recognized by the general manager as necessary and important; but for himself personally he needs something more. He needs what the old minister down in Maine expressed in a prayer. This old clergyman, who lived in the interior of the state, where the soil was rich and fertile, exchanged pulpits one dry season with a brother from the sea coast where the congregation was made up of men half-farmer and half-fisherman, and where the soil was sandy and poor. He opened his prayer as follows: "O Lord! I have been asked to pray for rain, and I do so; but you know, O Lord, that what this soil needs is dressing." Now, what the average claim agent needs more than anything else to spur him on and encourage him in his arduous and difficult labor is *dressing*. He needs the fertilizing influence of better pay. The position requires energy, capacity, work, and the compensation should be sufficient to secure and retain men possessed of these requisite qualifications. There is an old English burying ground in which is a monument erected to the memory of a young man who died at the early age of 21 years. The inscription chiseled upon the monument sets forth his name, date of birth and date of death, and then follows: "I expected this, but not quite so soon." I hope and trust that the management of our different lines may so early wake up to the importance of this point, that our younger members, at least, may be able to echo

* Paper read at the meeting of the Association of Railway Claim Agents, at Nashville, Dec. 6, by Mr. E. B. Hutchinson, of Richmond, Ind.

the sentiment traced upon that old grave stone. The present and growing tendency of courts to hold railroads to a more strict accountability, and of legislation to increase their liabilities, renders the position of a claim agent not only more difficult but also more necessary and important each year.

Baltimore & Ohio Locomotive Cab.

We illustrate in detail a locomotive cab designed by G. B. Hazlehurst, General Superintendent of Motive Power, which is used on several classes of engines on the Baltimore & Ohio Railroad. It will be seen that this is a combination, wood and iron cab having a round roof and doors at both front and back. The cab is 7 ft. long, and 8 ft. 10 in. wide outside. There are two sliding windows in the front, the sashes of which are 18 in. high and the glass 11½ by 13 in., and also two double sliding windows in the back, having sashes 18¾ in. high, and a total width of opening about 24 inches. The side windows are 2 ft. 9 in. square. The front doors are 4 ft. 1 in. high and 16 in. wide, and the back doors are 5 ft. 8 in. high and nearly 19 in. wide.


Front end outside finish.
Vertical section through back sliding window.
Vertical section through front at centre.
Vertical section through front window.
Vertical section through side window.
Wood screws
Outside front of cab.
Horizontal section through front window.
Section through front door.
Section through back door.
Section thro' front below door.
SECTION A B
SECTION C D
Glass 14"x27"
2¼ angle

LOCOMOTIVE CAB—BALTIMORE & OHIO RAILROAD.

The front of the cab is made of iron plate ⅛ in. thick, shaped as shown in the engravings, to which is riveted an outside plate $\frac{3}{16}$ in. thick, which is fitted and bolted to the boiler. There is a similar inside plate ¼ in. thick secured to the boiler by ⅝-in. bolts, and to the front plate as shown in the vertical section through the front.

In the same views the details of the use of angle irons is shown and the method of inserting the filling which is secured to the front plate by a screw in every third hole. The roof is covered with galvanized iron No. 27 B. W. G. thick, the joints running lengthwise and well soldered. All bolts extending through the roof are capped with galvanized iron. This iron roof extends down over the front and sides to the beading. At the round corners the roofing is hammered out of light iron or copper. The plates used at the back of the cab are of iron or steel No. 16 B. W. G. thick.

Another interesting feature is the method of forming and attaching the gutter over the side windows as shown in the vertical section through the side windows. The inside of the cab is finished with natural wood stain, varnished. It will be noticed that a roof ventilator is provided and also a disc ventilator in the lower part of the front. Other details of construction are clearly shown in the engravings.

The Chicago Drainage and Ship Canal.

At the annual meeting of the Drainage Board, President Frank Wenter made a report on the progress of work on the canal, from which we abstract the following. A route for the main channel has been adopted from the south branch of the Chicago River, near Ashland avenue, to a point one mile above Lockport, a total distance of about 28 miles. From Chicago to Summit the Illinois & Michigan Canal has been taken. Of this distance nearly 16 miles, divided into 16 sections, is under contract, making as many separate contracts. The total aggregate amount of these 16 contracts canvassed on the preliminary quantities of work is $11,544,964, the quantities of work under contract being:

Cubic yards of rock	11,330,778
Cubic yards of glacial drift	8,625,767
Cubic yards of dry rubble	274,131
The average price a cubic yard is, for rock	78.28 cents.
The average price a cubic yard is, for glacial drift.	26 23 "
The average price a cubic yard is, for dry rubble..	1.61 "

Jan. 25, bids will be received by the board for all excavations between Summit and Willow Springs not now under contract, and for dredging the Illinois and Michigan Canal between Chicago and Summit, consisting in all of 7,200,000 cubic yards of glacial drift, 95,000 cubic yards of rock, 30,000 cubic yards of retaining walls, and 1,800,000 cubic yards dredging.

There will still remain about 7,500,000 cubic yards of earth to let between Chicago and the range line near Summit, and perhaps 600,000 cubic yards of earth and 1,000,000 cubic yards of rock to carry out the work between the lower end of Section 14, above Lockport and Lake Joliet.

Work is in progress on thirteen of the fourteen sections below Willow Springs.—To Dec. 1, there have been excavated on these sections 72,110 cubic yards of rock and 343,375 yards of glacial drift, at an aggregate cost of $146,484.

Nearly all the right of way has been acquired between Willow Springs and the lower end of Sec. 14, and several pieces of land between Summit and Willow Springs, the total amount being 3,753 acres. The necessary surveys and engineering work are in progress to enable preliminary plans to be matured for all unfinished work between Chicago and Lake Joliet, below the city of Joliet, and for many of the important collateral and supplementary works.

The work so far let has gone to responsible contractors and at prices most favorable to the Sanitary District. It takes time to move in work of the magnitude of that which the Sanitary District has in hand. After contracts are let the contractors must procure extensive and elaborate plants to do the work economically. Such plants take many months to construct, and in the meantime only the lighter work can be done.

Shop Notes—Fort Wayne Shops of the Pennsylvania.

These shops are too well known to require extended description. The piece work system which has been used for a considerable time here continues to give satisfaceion as it is believed by those who are in the best position to know that not only do the men make better wages than are usual in shops where the rate per hour is the basis, but that about 50 per cent. greater output can be and is obtained from each machine. This is, of course, a very important feature as the return for every dollar invested in machinery is increased that much. The essential point necessary for the success of the piece work system is, not only that the rate paid shall be just, but that the men shall be satisfied that they are being justly treated. It has too often happened that where piece work has been introduced, reduction has followed reduction until the workman feels that there is nothing for him to gain by further efforts to increase the output. The system must in any case be used with judgment to succeed. Where the manager is an enthusiastic believer in piece work as is Master Mechanic Geo. L. Potter there is no reason to doubt continued satisfactory results from its use.

Among many interesting things at the Fort Wayne shops may be noted the following: Short coupling rods of I-shaped section are milled out on a Newton locomotive milling machine; long rods are milled at the ends only and the intermediate part planed out. Handsome riveted work on boilers is done by hand with a button sett. The practice of flanging steel sheets and using them without subsequent annealing is followed, and no trouble has resulted. Driving and truck axles are forged here from mild steel billets. In finishing passenger coach axles the journals are highly polished with emery, the axle being turned between centres by a belt around its centre, the object being to give a new journal as nearly as possible the same polish as it would ordinarily get after considerable use. A novel form of driving spring is being used, in which the bearings at the ends for the hangers are formed by bending back the end of the top plate to form a bearing instead of welding a piece on.[1] A considerable number of lag screws are made from old bolts, rapidly and cheaply. In the car department the material for freight cars is made ready fo[r]

erection and is loaded into cars and hauled to the car erecting shops, which are about 1½ miles distant. This system, which seems expensive at first glance, proves under the existing conditions to be economical.

Track Tanks on the Michigan Central.

The engravings printed herewith show the design and construction of four track tanks which are being built for the Michigan Central. These tanks are to be located at Forks Creek (near Welland), at Waterford, Taylor and Tilbury, all on the Canada Division; and they will be completed next spring. This division, over 200 miles long, is one of the most favorable railroads in the world for making a continuous fast run. It has easy grades and curves, and few of them, and has few or no large towns whose citizens are likely to make life a burden for the railroad managers whenever he decides to run an express train through without stopping. And while the local traffic is thus of a nature not to be injured by the presence of fast express trains, the through passenger business is good, so that trains can be profitably loaded for a through run without stops.

The tanks will each be about 1,400 ft. long. They are constructed of sheet steel $\frac{3}{16}$ in. thick, and put together as shown in the drawings. The stiffening rod along the upper edge of the sides is of half round iron 1½ in. in diameter, and the angle iron, by which the trough is supported on the sleepers, is 1¾ × 1¾ × $\frac{3}{16}$ in. Both of these irons are in suitable lengths to break joints with each other and with the sheets, and they are butt jointed. The size of the rivets is approximately shown in the drawing. Those through the half round iron and the angle iron are ⅝ in. in diameter, and those in the joints of the sheets are ¾ in. in diameter. The track ties are 8 × 8 in., and 8 ft. long.

Fig. 2 shows the section of the nipple by which the pipe for admitting water and steam to the trough is fastened to the side of the latter. The nipple itself is of brass, and the inside diameter, ½ in., is the same as that of the iron pipe running into it.

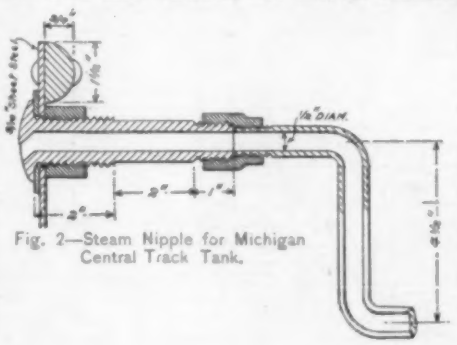


Fig. 2—Steam Nipple for Michigan Central Track Tank.

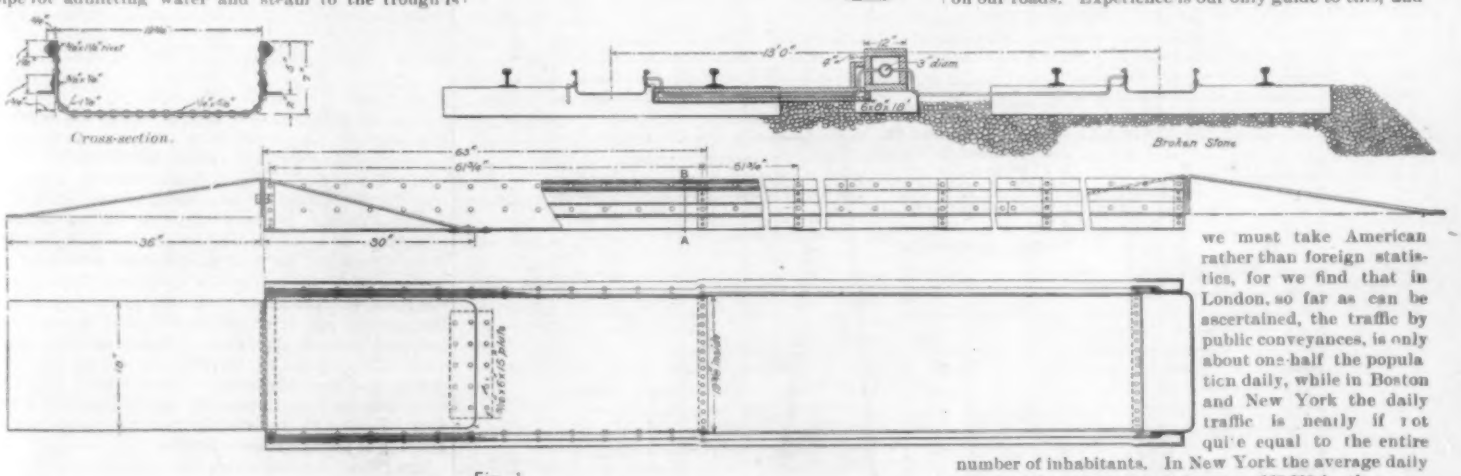


Fig. 1.

Cross-sections, Side Elevation and Plan.

Track Tanks—Michigan Central Railroad.

Passenger Traffic in Great Cities.*

For general purposes, we may consider that the average speed of a pedestrian is about 260 ft. a minute, or nearly three miles an hour. Where the home and place of business are within ten minutes' walk, or half a mile apart, the average man goes home to his dinner in the middle of the day and returns to his place of business, taking out of his day about 20 minutes, and occupying one third of his resting time in his passage to and from his resting place, or if his business is such that he is required to go from place to place during the day within the limits of a mile or two, the proportion of his time occupied in passage from place to place is not so great as to seriously interfere with the transaction of a very large amount of business. If these limits are extended, however, to twice this distance, the condition of things is changed entirely. . . So much time is required in passing from one place to another, that it is found profitable for some of the community to provide means for more rapid communication between distant points.

. . . Some means of travel which will enable greater speed to be attained has become a necessity and the fulfilling of the demand for it in cities of more than two or three miles in length or breadth is one of the great problems awaiting satisfactory solution. In London it has been attempted to be solved by going underground, in Berlin and in New York by going overhead, and now Brooklyn, Chicago and Philadelphia are engaged in constructing overhead roads also. Whether to go overhead or underground is still agitating the minds of the centres of science and philosophy, Paris and Boston. As regards the comfort and convenience of passengers, there can be no question of the advantage of the German and American method over the English.

In attempting to solve this problem for any city, the first thing to be considered is the maximum interval of time that people are willing to spend in traveling between the place of business and the home, or generally in going from one section of the city to another. This can be determined pretty closely by considering the amount of dissatisfaction and grumbling and agitation of means of transit, which has shown itself in various cities at different stages of their existence, and it appears as if the unit of time for local travel is about 20 minutes, and that whenever this time has been exceeded in any city in passing from place to place, either for business or pleasure, discontent has arisen and a demand for more speedy transit . . . To what size cities may grow in the future is impossible to say, but at the present time it seems as if we might with safety assume that the thickly populated portion of a great city within which means of intramural, as distinguished from suburban traffic, are required, may be included within a circle of ten miles diameter, and that the 20 minute limit may be applied to distances of from 7 to 8 miles, with satisfaction to probably 80 per cent. of the habitual travelers.

Fundamental Principles.—With this starting point we may establish certain principles as those which should govern the construction of a system of intramural transit for a great city and which have to be taken into account in the original laying out of a city which is destined to become great, or in the alterations of the lay-out of a city which has become great to an extent far in excess of the ideas of its original designers.

In the first place there must be a provision made for three classes of travel:

1. That which can be conducted on the surface at a speed of not greater than 600 ft. a minute, or about 7 miles an hour. A greater speed than this would be dangerous, as was before remarked, to persons and to property. We will call this tram transit.

2. That which can be carried at nearly double the speed of the first, or 1,200 ft. per minute, with stations as close together as will enable this average speed to be maintained. It must be borne in mind here that an average speed of 1,200 ft. per minute, or 13.5 miles an hour, with frequent stops of from 8 to 20 seconds each, involves the necessity for double this speed between stations, so that any motive power applied to the vehicles must be capable of starting promptly and attaining a maximum speed at the centre between stations, and coming to a stop in the remaining distance. This will be found to enable stations to be placed at about one-third of a mile apart. This may be termed Quick Transit.

3. Then there must be an additional system provided for carrying passengers at an average speed of about 2,000 ft. a minute, or 23 miles an hour, and this requires stations to be not over 6,000 ft. apart. This we will term rapid transit. Greater average of speed can only be attained by placing the stations much farther apart.

Now, it is not necessary, nor indeed is it desirable, that these systems should all be in identically the same location, but they should be so placed as to have numerous points of contact with each other to provide for interchange of passengers from one system to the other with the least possible expenditure of time and trouble.

A very common idea, and one which is frequently propounded by careless thinkers and writers upon rapid transit, is that the lines of speedy communication should be on important thoroughfares and co-incident with the main arteries of travel. This statement of principle has an alluring sound, and at the first glance seems to carry conviction with it, but when we consider the real object to be attained by a rapid transit system in a great city, it is found to be incorrect. The characteristic of what in a great city is termed a great thoroughfare, is that it affords rather a loitering place than a route for speedy traffic for long distances. . . . Now the object of rapid transit is not to intensify such crowds, not to bring into one district thousands of people who have no business there particularly, but whose only object in going there is to obtain the means of being carried somewhere else. It is needed to divert and dissipate such crowds, and while making the means of access to and exit from each section easy, to avoid as far as possible the concentration of masses of people in limited localities where they are not needed and in which they do not themselves desire to remain.

The object particularly to be avoided in the location of a line of speedy travel, is the concentration of crowds on a single central route, and a line should be so located that it can collect passengers from outlying districts out of the reach of the main thoroughfares and deposit them at convenient points in the district of the principal business, along and in the immediate vicinity of the main thoroughfares, but rapid communication is not desired nor desirable between the several points immediately on or along the most frequented streets of the city.

Estimates of Traffic.—Now we want to know about what proportion of the population will want to travel on our roads. Experience is our only guide to this, and we must take American rather than foreign statistics, for we find that in London, so far as can be ascertained, the traffic by public conveyances, is only about one-half the population daily, while in Boston and New York the daily traffic is nearly if not quite equal to the entire number of inhabitants. In New York the average daily number of passengers last year was 120,000 by the cross town horse cars, 500,000 by the longitudinal lines of horse cars and 600,000 by the elevated railroads.

It is not safe, therefore, to allow for less than one trip a day for every inhabitant.

If these passengers would come regularly, distributing themselves evenly over the 365 days of the year and the 24 hours of the day, the problem of handling them would be simple. But they will not travel this way. They come like the rainfall and the wind and the temperature, and averages are as misleading in planning for their transportation as are the average travel of the wind in computing the strains on a bridge or a chimney, the average precipitation of rain in designing the spillway of a dam, or the average temperature in arranging a heating apparatus.

In the first place, there is the monthly variation of traffic, the minimum occurring generally in July, when everybody who can do so leaves a large city, and the maximum in December. There is about 20 per cent. difference in the amount of travel in these two months.

There does not seem to be any recognizable variation according to any rule, in the days of the month, but there is a very marked fluctuation in the days of the week, the amount of travel on Friday being invariably about 10 per cent. below the average for the week. This is variously accounted for by those who are familiar with the fact, but the general interpretation of the phenomenon by the employés of the road is that a great number of women look on the day as unlucky, and will not shop or visit on a Friday.

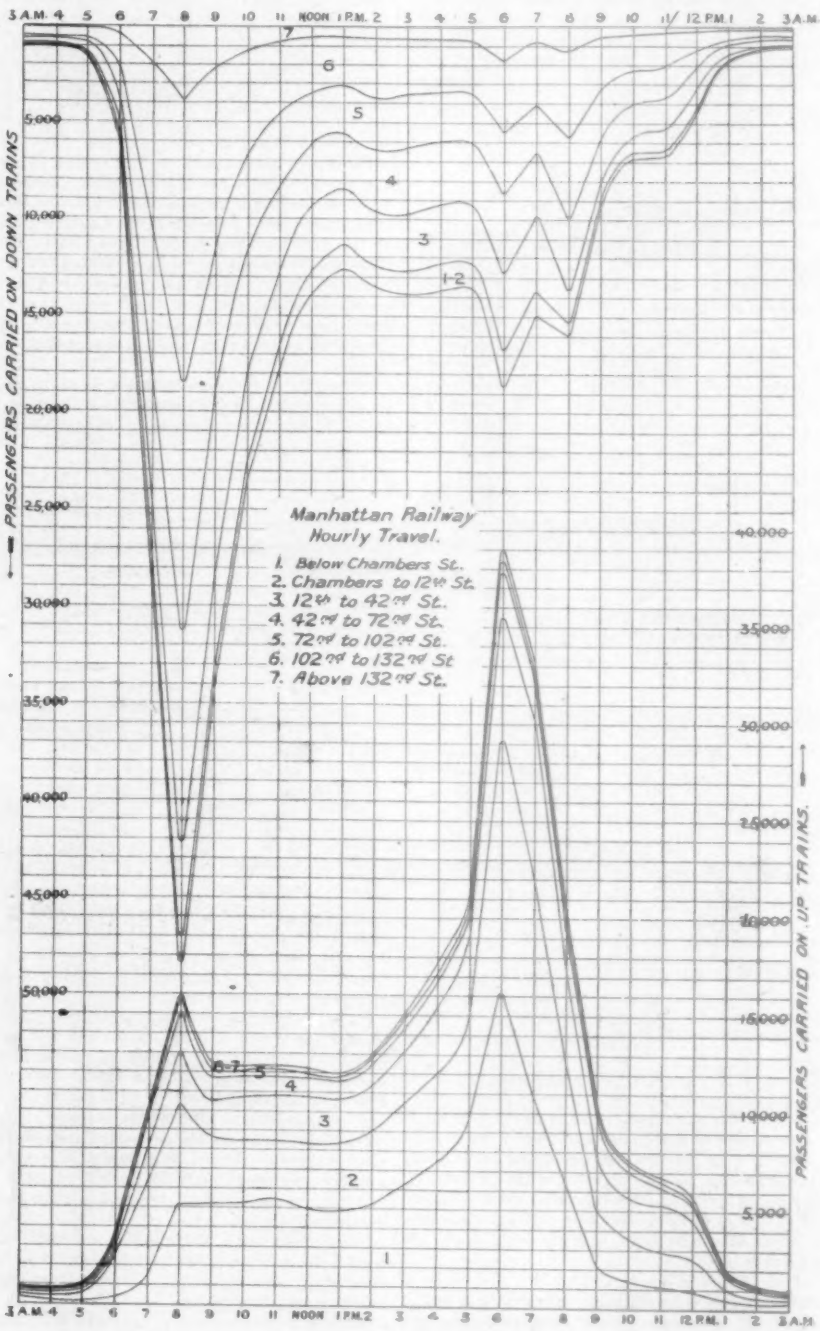
Then there are special occasions to be provided for such as a severe storm, which affects all lines alike, forcing everybody who must be out of doors into taking some means of conveyance, or a great festivity or parade which also crowds to its utmost capacity every line of travel, or a foot-ball match which especially effects the lines of travel leading to the scene of conflict, and incidentally also affects every line within a mile of it. Such occasions occur at no stated intervals, but they must be provided for, and the capacity of travel to be provided on any route must not be less than double the average daily duty of that line in order to be prepared for such contingencies.

But these fluctuations of travel are as nothing compared to the hourly variations every day of the year. There is no line of traffic in a large city on which some

* Extracts from an address by J. James R. Croes, M. Am Soc. C. E., M. Inst. C. E., delivered before the students of the Rensselaer Polytechnic Institute.

passengers are not found to travel at any hour of the day or night, but the greater proportion by far, of course, travel by the day hours, and, in consequence of the conditions which demanded the construction of the rapid transit lines, the variations during these hours are enormous.

Hourly Fluctuations of Travel.—The illustrations of the hourly fluctuation of traffic which I shall give you are derived from the record of travel on a day which fairly represented the average travel on the Manhattan Elevated Railway in New York City, which was kindly furnished me in detail by Col. F. K. Hain, the General Manager, and they no doubt represent correctly the variations which are to be expected in any great city in which the centres of business and population are widely separated.



PASSENGER MOVEMENT ON THE MANHATTAN SYSTEM—BY HOURS.

The hour of minimum traffic is from 3 to 4 o'clock in the morning, and during that hour there are carried only two-tenths of one per cent. of the total passengers during the day. From 4 to 5 o'clock, the travel increases slowly, and from 5 to 6 o'clock, about 1½ per cent. of the daily travel occurs, which increases in the next hour to seven per cent., and in the hour from 7 to 8 o'clock, to 13 per cent. of the total traffic. Between 8 and 9 o'clock there are about nine per cent. of the passengers carried and from that time until 5 o'clock in the afternoon there is but little variation, the traffic each hour amounting to about 4¼ per cent. of the total traffic, but during the hour from 5 to 6 o'clock in the afternoon all the lines are again crowded and about 10 per cent. of the total travel is concentrated in that hour. From 6 to 7 o'clock seven per cent. of the traffic occurs and from that time until 2 o'clock in the morning the decrease is very regular down to an hourly duty of four-tenths of one per cent. of the total. The average hourly travel being one-twenty-fourth, or a little over four per cent. of the daily total, we see that the minimum hourly traffic is one-twentieth of the average and the maximum is three times the average

Leaving out of account the exceptional crowds which are attracted to the roads by festivities and other extraordinary occasions, it appears, therefore, that in order to carry on the average daily traffic provision must be made for accommodating at stations and on trains at least four times as many passengers as it would seem necessary to provide for if the daily average alone of travel were taken into consideration. But here comes in still another consideration. There are certain districts from which a larger proportion of the passengers must be carried than the average of all districts. The greatest of these is of course the business centre, the most densely occupied in the daytime and the most sparsely populated district in the city. In the city of New York this central district is in the vicinity of the City Hall.

Dividing the city into half-mile sections by circles described from the Battery as a centre, we find that the uptown travel during the busiest hour of the afternoon, between 5 and 6 p. m., which leaves the first mile from the Battery (which just includes the City Hall station of the Third Avenue Railroad), is 42 per cent. of the entire upward travel during that hour, or 2.7 per cent. of the entire traffic for the day over all lines. With a daily traffic of 600,000 passengers, the are 16,200 passengers take the trains below Chambers street between 5 and 6 o'clock in the afternoon. If this number of passengers stood in line in single file as close as they could stand together, they would make a line five miles long. These passengers take the trains at 11 different stations, but 25 per cent of them are taken on at one station, that at the City Hall and Brooklyn Bridge, and if they should come on in a line two abreast they would form a column extending down Park Row and Broadway to below Wall street.

The next strip of a mile long, extending up to Houston street, furnishes in that same hour, 5 to 6 o'clock, 10,000 passengers, and within the remaining eight miles up to the upper limit of the roads, only 13,000 passengers go up during that hour.

The downward travel, which curiously enough is about 12 per cent. in excess of the upward travel, is distributed over the day differently, as may be supposed. It reaches the maximum between the hours of 7 and 8 o'clock in the morning, when 49,000 passengers, or eight per cent of the entire daily traffic, are carried southward. Thirty thousand of these passengers come from north of Seventy-second street. From 8 to 12 o'clock, the hourly traffic falls very regularly until it is 14,000 passengers per hour. From 12 to 1 o'clock there are 12,800 passengers; between 1 and 5 p. m. the hourly average is 14,000 passengers. From 5 to 6 p. m. the residents of Brooklyn and New Jersey swell the downward travel to about 19,000 per hour. Between 6 and 7 o'clock the travel falls off rapidly, but from 7 to 8 o'clock there is a considerable increase, attributable doubtless to the people uptown going down to the theatres, as the greatest travel in that hour is from the Harlem district. After 8 o'clock the decrease until 2 o'clock in the morning is very regular, except that between 10 and 11 o'clock there is a considerable accession of passengers from the central portion of the city in which the places of amusement are situated, indicating that a considerable number of attendants at the theatres reside in Brooklyn and New Jersey.

These fluctuations of the hourly travel may be best appreciated by inspection of the accompanying diagram which shows graphically the number of passengers who purchased tickets and took trains in each direction during each hour of Wednesday, May 18, 1892, in each of seven sections from South Ferry to Washington Heights in New York City. The first section extends to Chambers street, and is one mile long. The others on each a mile and a half long. The entire traffic as divided between the four lines of road was as follows:

	Up.	Down.
Ninth Avenue	39,920	21,890
Sixth Avenue	94,946	123,935
Third Avenue	116,216	123,534
Second Avenue	32,257	48,294
Total	282,819	317,753

Total, 600,572.

The only record that is kept is that of the departure from stations, no account being taken of the number of passengers that arrive from any station, either for the whole day or during the different hours of the day, so that the destination of the passengers and the average length of the ride per head cannot be reached with any certainty. It is not improbable that a pretty accurate determination of the average distance traveled by passengers could be arrived at by a careful study of the statistics with the aid of diagrams and observations of the general character of the travelers themselves at different hours of the day at different stations, coupled with a knowledge of the class of occupancy of the different sections of the city. I do not know that such a study has been attempted by any person, but I think that it might be undertaken with the expectation of arriving at pretty accurate results.

Now, these figures which we have been examining refer only to one mode of transit, that which we have called quick transit, and that on four lines running longitudinal of the city. They do not take into the account the nine longitudinal lines of what we have called tram transit, namely, that which carries passengers at about double the speed at which they can walk and of which there are 118 miles in use in the city, carrying daily at least 90 per cent. as many passengers at the quick transit lines do, nor is any account taken of the 28 miles of cross-town tram transit roads which carry about 25 per cent. as many passengers as the quick transit roads do.

The principles governing the movement of passengers on all these lines are, however, very nearly the same as those which regulate the travel on the quick transit lines. These general rules are, that the travel on one day may be double the average travel for the year; the travel in any one hour may be three times the average hourly travel for the day; the travel in any one direction alone in any one hour may be twice the entire average hourly travel for the day; and the travel from one half mile section alone in one hour of the day may be at least 40 per cent. of the average hourly travel for the whole day.

Practical Use of These Studies of Movement.—The practical application of these studies of variation of travel is made in providing for the equipment and operation of a road, intended for whatever grade of transit. Provision has to be made for station facilities, employés of all kinds, rolling stock and supplies necessary for maintenance and operation to meet the varying demands of each locality at different hours of the day.

It has been the custom on at least one of the old established horse car lines in New York City, and doubtless on other lines and also in other cities to keep records of temperature, the weather, the number of cars on the road at each hour of the day, the number of employés in service, and of all complaints of defective service at the several hours of every day, and to keep these records in such shape that the results of different conditions of operation can be compared with a view to regulating the expenses and the operation in accordance with experience. It is said by the manager of one of these lines that knowing the time of year, the day of the week and the condition of the thermometer and the barometer, he can provide for the required number of cars to be sent out from the stables and the number of employés to operate the road for that day with the best results.

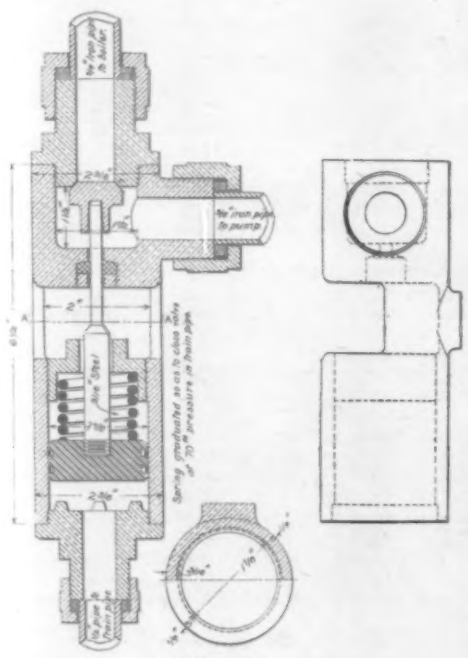
In providing for the daily service on the quick transit lines, as may readily be supposed, experience, good judgment and promptness in decision and action are essential to conduct the business of any day with success. The interests of the owners of the lines must be consulted to prevent unnecessary expenditure, and the interest of the public must be carefully looked after to prevent unnecessary delays or obstruction to travel.

Of course there will occur occasions even on the best managed road in which some extraordinary rush of travel occurs that is so far in excess of the capacity of the road that great inconvenience results both in the management and to the public. Such an instance occurred at the recent Columbian Celebration in New York City, in which all lines of transportation were taxed far beyond their capacity, the movement of passengers being from 50 to 80 per cent. greater than the general daily average on the railroads entering the city, and on the elevated railroad lines being about 60 per cent. in such excess. On Oct. 12, the Manhattan system carried 1,075,537 people. The expression, a million people, does not convey any very definite idea to the mind, but it may assist us to understand what that figure means if we say that if the people who traveled on the elevated railroads on that day were arranged in single file as close as they could conveniently stand together, the line would reach from the Battery, in New York, up along the Hudson River to Albany and out on the New York Central Railroad as far as Auburn; or they would reach from Troy to 40 miles beyond Buffalo. When we consider that probably there must have been at least 150,000 of these people who wanted to take the cars at the same time when the parade was breaking up, that this crowd would fill 300 trains of cars to their utmost capacity, and that that number of trains distributed over the entire tracks of the elevated railroads, both up and down, would leave only 300 ft. intervals between trains, it is not surprising that there was considerable delay in getting on and off the trains and that travel was very slow; but it is remarkable that, so far as known, not a single accident occurred to any of the 3,000,000 of passengers that were carried in the three days, Oct. 10, 11 and 12.

(TO BE CONTINUED.)

Air Pump Governor, Wabash Railroad.

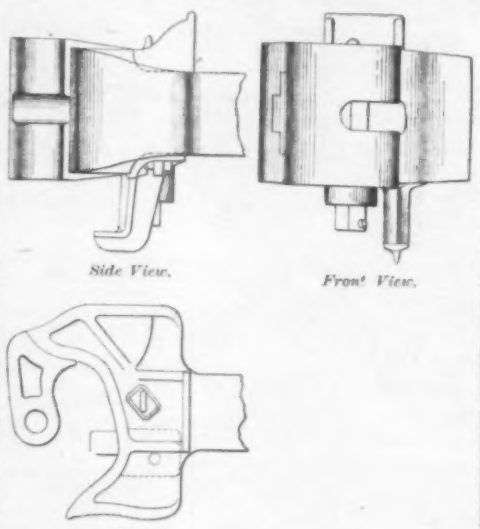
We illustrate the air pump governor designed by Mr J. B. Barnes, Superintendent of Motive Power, Wabash Railroad, which has been in use on that road for several years and has given excellent satisfaction. It will be seen from the sectional view that the governor is extremely simple, so simple, in fact, that any description is almost uncalled for. The steam pipe from the boiler is connected at the top of the governor casting and the lead from the governor to the air pump is shown at the side, while the train pipe connection is at the bottom of the governor casting below the piston as shown. The steel spring above this piston, which is made of wire $\frac{1}{16}$ in. in diameter, is adjusted to close the valve at 70 lbs. pressure in the train pipe. The governor is placed in the cab, and as it is but about 10 in. long and 2¼ in. in diameter, it occupies very little space. There is leakage enough at the valve to keep the pump from freezing in winter. As this governor possesses the good qualities of occupying little space, being simple and very quick in action, it is not surprising that it has been found very satisfactory in service.



Air Pump Governor, Class F Engine—Wabash Railroad.

The Welch Safety Attachment for M. C. B. Couplers.

We show herewith a simple device intended to prevent an M. C. B. coupler falling on the track in case it pulls out because of any failure of its fastenings to the car. It will be seen that the device consists simply of a bracket which is attached by bolt and cotter to the under side of the drawhead. A hook on the bracket projects far enough forward of the coupling face of the drawhead to prevent the other drawhead, which engages with it, dropping clear. It would fall something less than half the depth of the knuckle, and would carry the coupler at least 20 in. above the track. The attachment does not interfere with coupling with a link and pin should a knuckle be broken. The three views given in the engraving show the attachment with sufficient clearness. It is patented and controlled by the Welch Safety Attachment & Car Coupling Co., of Birmingham, Ala., the Secretary of which is Mr. C. B. Gifford, Master Mechanic South & North Alabama Railroad Co.



Side View. *Front View.* *Plan.*

Welch's Safety Attachment for the M. C. B. Coupler.

The Weaving-Shed Form of Construction for Machine Shops.*

In many respects the weaving-shed plan—that is, a one-story structure in sections, separately roofed, with the north sloping side of glass—has advantages. As to ventilation, in its simplest form it may be inferior, but the ventilation is easily controlled when the problem is once fairly attacked. Common and fashionable as is the salt block construction—that is, a central high section with a gallery on either side—this form, when used in a shop so small that one foreman has control of all the machinery, has this disadvantage, that he has to "see saw" across from side to side, worming his way through the erecting sections, whereas, with the erecting floor at one side, the machine tools are concentrated. With a small shop, too, the climbing up and down stairs is not only a nuisance, but absolutely costly. Things can be moved in an elevator very cheaply, but carting, loading unloading and carting again spoils the economy. It is doubtful if there is any saving in two or more storied shops, except in real estate, and when as much ground has to be left idle to get light as is covered by buildings, then the saving in real estate is small, unless the buildings are more than two stories in height.

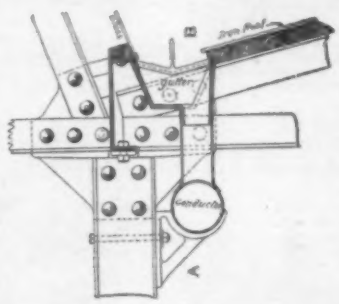


Fig. 1.

The advantage of the one-story weaving-shed roof plan is that the building can be extended to any length in either direction, and to any width in one direction, without interference with light, with advantage in heating, and with the advantage of having everything on one floor, and that floor a solid one. The trouble apprehended from ice, snow and water has no foundation in fact, and if dealt with in the way described later, need not give one moment's anxiety. The section for traveling cranes can be of any height and width, without interfering with the weaving-shed structure or light, by placing it on the south side.

Machine-shop floors are a problem, and while those made of dirt, like some of the French ones, seem to last the longest, they are hardly satisfactory; neither are the English brick floors. The following, used in the works of the Straight Line Engine Co., is believed to be better than most of the floors heretofore constructed. The earth was excavated to a depth of 27 in. below the floor line, and rolled with a heavy roller, the soft places filled, and again rolled and levelled. Building-stones of the cheapest sort—that is, stone too poor for foundation walls—were dumped on the ground, and men set to sorting the largest pieces and closely packing them on the ground; a strip of two or three ft. of this work was kept in advance of the other filling, so as to insure its solid character. Upon this was a layer of the smaller stone, then broken stone, coarse gravel, fine gravel, and, lastly, sand. There is no other possible way in which each grade can be made to retain its place, except by reversing the process and putting the larger above the smaller. If mixed indiscriminately, the fine will work to the bottom and the coarse come to the top. By following the plan given, a solid foundation is secured, upon which is placed nothing but 2-in. hemlock plank running one way, with a 1-in. planed and jointed but not matched floor running the other way. The advantage of the thin top is that when there is a hole worn through, it is but an inch deep at the most, and the plain strips of uniform width make it easy to repair. This makes a floor on which anything can be set anywhere, except the largest of the machine tools requiring separate foundations.

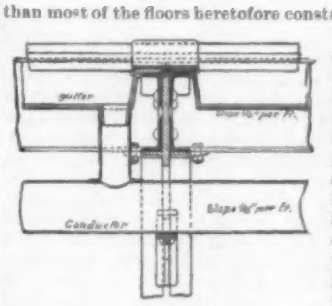


Fig. 2.

Section A, B.

Some accounts of English practice give 16 ft. as the width of spans or bays, but in the works above mentioned 32 ft. is used, 8 ft. being the unit upon which the building is constructed. In a more extended plant, 10 or 12 ft. would be proper. The posts are 8 ft. or 16 ft. between centres, and all the roof trusses 8 ft. The roof is simply 1¼-in. pine plank, 16 ft. long, planed and matched, planed side down, nailed to thin strips of bass wood riveted between the two angle-irons which form the rafters, covered with ribbed, not corrugated, iron, and the flat roof over the traveling-crane section is the same, except the gravel roof.

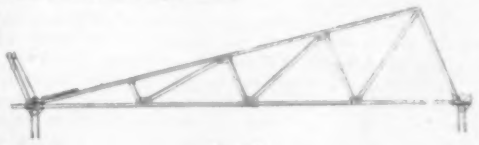


Fig. 3.

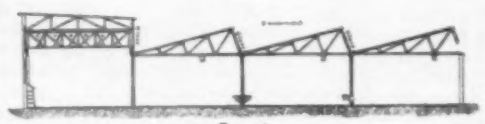
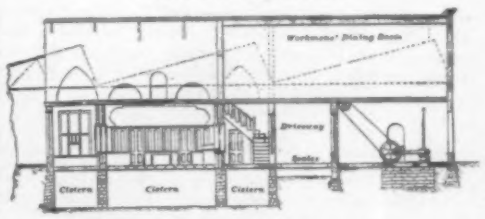


Fig. 4.

Cross-section, looking west.



Section through Office and Engine Room.

In the construction of the posts and roof, by making each member of two pieces, ⅝ or ¾ in. apart, between which bolts can be passed, a convenient means is at hand to fasten anything anywhere. The iron structure is more expensive than wood, but lighter, exempt from fire, and, with the provision for bolt attachment above referred to, more convenient. The trusses are strong enough to hold three or four tons besides the roof, so that any pieces of machinery or work which are liable to be handled can be raised by tackle attached to the trusses in whatever part of the place they may be.

The question of snow, which seems to be the bugbear to everyone first thinking of the weaving-shed roof, is one requiring hardly a second thought. Making the gutter of cast-iron, as shown in figs. 1 and 2, or any convenient shape, and putting it inside the building, with the heating pipes adjacent, is all that is required. Keeping the gutters clean is all there is to it, and snow and ice will thaw sooner in cast-iron than on the wood planking when the heat comes from the lower side.

Eight feet between centres would seem to be too near together for posts, but by making benches 12 ft. long, supported by two posts, leaving 4 ft. spaces between the ends of the benches, the apparent objection vanishes where the bays are as wide as 32 ft.

In a building for large work, with 10 ft. between trusses the bays could easily be 40 or more feet, with 8 ft. of glass on the northern slope.

* Paper read by Prof. J. E. Sweet before the American Society of Mechanical Engineers.

The geometry of the roof is very simple—simply dividing the lower chord into four equal parts, and the rafter into four equal parts, and joining the points with the struts and braces (fig. 3). While economy of material would dictate iron of different section and weight, to save bother we used all alike, and as the accidental loads are unknown quantities placed in unknown positions, perhaps that was as well as applied high science. The accompanying cut, fig. 4 is self-explanatory.

In the weaving-shed system of lighting the annual cost for repairs of broken glass is practically *nil*, and in this connection the writer volunteers to say that he believes an erroneous idea is pretty universally prevalent in regard to the most economical size for lights of glass for shop lighting. The theory is that the small size lights for various reasons are the most economical. But after a long observation, the evidence to me is conclusive that the larger the lights the less the cost for repairs. Large lights stand far more punishment, and the workmen have some respect for a light of glass which costs a dollar, but none whatever for 10 × 15 glass. Whether these are the reasons or not, the fact remains that where in one part of our works the annual breakage of 10 × 15 glass does not fall below 100, there is another part where the large lights were equally exposed, and there was but a single light broken in two years.

The World's Railroads in 1890.

Extra Census Bulletin No. 24 has recently been made public. It is an exhibit of the railroad mileage of the world at the end of the year 1890. Two weeks ago we printed a general table from this bulletin, giving the world's railroads and the miles of railroad for each 100 square miles of territory and for each 10,000 inhabitants. The text of the bulletin contains about 4,000 words, mostly too general to reprint; but it contains also some interesting diagrams, which we reproduce Besides the diagrams we reproduce from our issue of Jan. 15 the sketch map showing the territorial grouping of railroads which has been followed in the census publications. We also reprint other tables of interest.

Although the carelessness detected in the general table makes one suspicious of the accuracy of the whole document, the diagrams are, without doubt, sufficiently correct to give a just pictorial representation of the facts which they purport to present. These facts are so obvious that there is little occasion for comment upon them. It will be observed that at the end of 1890, 44 per cent. of the entire railroad mileage of the world lay within the boundaries of the United States.

Referring to the diagrams, it will be seen that in Group I. (that is the New England States) more than one half of the total mileage built had been reached in 1860 and that between 1840 and 1850 more railroad was built than in any subsequent decade. It will be seen also that railroad building in Groups II. and III. has gone on since 1850 at pretty nearly a uniform rate, and that in these groups the mileage per hundred square miles of territory is much greater than in any of the other groups. These facts are accounted for by Professor Adams by the necessity for reaching the seaports with the great traffic of the interior. An examination of the diagrams shows that in the southern and gulf states there have been two decades of special activity, namely 1850 to 1860 and 1880 to 1890. Especial attention is called in the bulletin to the progress made in Group VI., which embraces the territory, especially tributary to Chicago.

Feed Water.*

Those answerable for the maintenance of locomotives in sections where the water is comparatively from incrusting matter, cannot realize the advantages they have over those occupying similar positions in the bad water regions of the West where the best water contains as much as two lbs of incrusting matter per 1,000 gallons, and the poorest as high as 20 lbs. This will give six lbs. and 60 lbs. per ordinary tank of 3,000 gallons. It was necessary to use the last mentioned water for years before it was possible to provide a better quality. Under such conditions it is not surprising that the life of flues and firebox sheet is short, for even with the greatest care in washing, the sediment will accumulate. It first gathers next to the back flue sheet near the centre where it is impossible to dislodge it. These flues begin to leak and this tends to draw the deposits the faster to that point. Caulking is resorted to and is continued at intervals until there is no alternative but to remove all or part of the flues and take out the mud and scale.

Our plan is to remove about 50 flues, taking every other one in alternate rows without disturbing the steam pipes. Then the dirt can be washed and scraped from between the balance. The 50 flues are then reset and the boiler will give good service until it fills up again when all the flues are taken out. Wash-out plugs are provided at boiler head and on sides of boiler in line with the crown sheet. They are frequently removed and by forcing water through these openings under high pressure, and by using small steel rods to break loose any scale that has become wedged between the bars, this sheet may be kept from injury. After about one year's service the side sheets first begin to fail with small cracks commencing as stay bolts and spreading outward until they reach from one bolt to another. Next the back flue sheet is affected in the same manner, and finally the door sheet. The trouble usually begins in centre of sheet fore and apt and at third row of bolts above mud ring. Caulking is first resorted to, then comes plugging and patching in rapid succession until about the third year, when new back flues and one-half side sheets are in order. A brief respite ensues at the of which the end above process is repeated until the sixth year when a new firebox must be put in. These various reparations may be classified as follows:

			Cost of Repairs.
6	Partial changes of flues,	24 days	$300. 0
6	Full " " "	48 "	900.00
2	Laid in for patches	12 "	100.00
1	" " " ½ side and back flue sheet,	30 "	300.00
1	Laid in for new firebox,	45 "	450.00
		159	$2,050.00

Value of engine per day $8.

These are conservative figures, and here is an actual loss of service of 26½ days yearly, at a cost of $212, or a total loss of 159 days amounting to $1,172 in the six years that is the direct result of bad water. To this must be added the cost of boiler repairs amounting to $2,050, which give a total loss of $3,322.

. . . If there is so vast a difference between good and bad feed water as these examples would imply, there must be a wide margin for improving the latter, and to this end I might suggest the following methods:

1. By discontinuing the use of particularly bad water whenever practicable to supply a better quality.

2. By filtration. It is claimed that successful work is being done in this direction by the Pennell method.

3. By mechanical devices, a number of these are in use with varying degrees of success.

4. By chemical compounds.

Since no one of these methods is entirely successful, and all of them are more or less beneficial, why would it not be wise to take advantage of them all? . . . I think a systematic effort on the part of a large railroad to improve the condition of feed water, would be productive of astonishing results.

*From a paper read by Mr. McIntosh before the Northwest Railroad Club.

RAILROAD MILEAGE IN THE UNITED STATES, BY YEARS, 1890 TO 1880, INCLUSIVE, BY TERRITORIAL GROUPS.

	1890.	1889.	1888.	1887.	1886.	1885.	1884.	1883.	1882.	1881.	1880.
Total for entire country: Miles	163,597.05	156,135.95	151,268.55	142,637.53	130,760.23	125,182.58	121,794.22	116,851.31	106,999.97	98,435.06	87,724.08
% of increase	4 78	3.22	6.05	9.08	4.46	2.78	4.23	9.34	11.98	8.79	.....
Group I: Miles	6,877.67	6,606.38	6,531.47	6,462.03	6,308.12	6,252 51	6,222.15	6,172.75	6,112.19	5,991.79	5,865.81
% of increase	4.11	1.15	1.07	2.44	0.89	0. 49	0.80	0.99	2 01	2.15	.....
Group II: Miles	18,613.82	17,994.49	17,833.28	17,653.78	17,444.19	17,248.39	17,084 79	16,539.33	15,516.03	14,669.55	14,215.06
% of increase	3.44	0.90	1.02	1.20	1.14	0.96	3.30	6.60	5.77	2.98	.....
Group III: Miles	21,718.27	21,243.82	21,094.07	20,677.70	20.316.97	19,982.20	19,582.04	19,345.41	16,407 85	15,206.76	14,307.34
% of increase	2.23	0.71	2.04	1.75	1.68	2.04	1.22	17.90	7.90	6.29	.....
Group IV: Miles	9,032.08	8,224.77	7,854.83	7,243.99	6,605.90	6,331.90	6,302.46	5,947.97	5,549.67	5,211.01	4,691.42
% of increase	9.82	4.71	8.43	9.66	4.33	0.47	5.96	7 18	6.50	11.08	.....
Group V: Miles	18,635.09	16,978.78	15,985 91	14,350.13	13,641.86	12 954.60	12,042 31	11,075.96	10,098.81	9,011.90	8,567.61
% of increase	9.76	6 21	11.40	5.19	5.31	7.58	8 72	9 68	12.06	5.19	.....
Group VI: Miles	37,463.44	36,346.23	35,049.90	33,055.42	31,427.87	29.400.80	29,224.85	28,278.09	26,984.21	24,589.33	22,475.27
% of increase	3.07	3.70	6.03	5.18	6.89	0.60	3.25	4.79	9.78	9.37	.....
Group VII: Miles	8,886.93	8,083.82	7,694.53	7,210.67	5,513.71	4,768.97	4,429.76	3,722.80	3,255 27	2,714.19	2,541.90
% of increase	9.89	5.10	6.71	30.78	15.62	7.66	18.99	14.36	19.94	6.78	.....
Group VIII: Miles	20,355.20	19.809.63	19,162.81	17,172.68	12,351.24	11, 748 32	11,614.73	11,333.53	10,017.98	8,807.31	7,600.38
% of increase	2.75	3.38	11.59	39.04	5.13	1 15	2 48	13.14	13.75	15.85	.....
Group IX: Miles	9,854.18	9,237 82	9,059.62	8,599.71	7,672 65	7,305.99	6,874.77	6,762.81	6,726.75	4,001.11	3,041.04
% of increase	6.67	1.97	5.35	12.08	5.02	6.27	1.66	3.62	63.12	31 57	.....
Group X: Miles	12, 160 37	11,607.21	11,002.13	10,216.12	9,477 72	9,188.90	8,416.36	7,677.75	6,401 21	5,241.62	4,388.25
% of increase	4.77	5.50	7.69	7.79	3.14	9.18	9.69	19.86	22.12	19.45	.....

RAILROAD MILEAGE IN THE UNITED STATES FOR CENSUS YEARS 1830 TO 1890, INCLUSIVE, ASSIGNED TO TERRITORY AND TO POPULATION AND BY TERRITORIAL GROUPS.

	1890.	1880.	1870.	1860.	1850.	1840.	1830.
Total for entire country: Number of miles of line	163,597.05	87,724.08	49,168.33	28,919 79	8,571.43	2,755 18	39.90
Per cent of increase	86.49	78.42	70.02	237.40	211 10	6,822.56	.....
Line per 100 square miles of territory	5.51	2.95	1.69	0.97	0 29	0.13	.....
Line per 10,000 inhabitants	26.66	14.79	12.75	9.20	3.71	1.61	0.03
Group I: Number of miles of line	6,877.67	5,865.81	4,326.73	3,644 24	2,595.57	513.34	.....
Per cent. of increase	17.25	35.57	18.73	40.40	405.69	.....	.....
Line per 100 square miles of territory	11.15	9.46	6.98	5.88	4.19	0.75	.....
Line per 10,000 inhabitants	14.71	17.48	12.40	11.63	9 51	2.30	.....
Group II: Number of miles of line	18,613.82	14,215.06	9,572 61	5,992.77	2,722.48	1,296.40	29.80
Per cent. of increase	30.97	47.84	65.41	120.12	111.70	4,251.44	.....
Line per 100 square miles of territory	17.51	13.40	9.38	5.64	2.56	1.17	0 04
Line per 10,000 inhabitants	13.53	12.45	10.40	7.39	4 12	2.58	0.15
Group III: Number of miles of line	21,718.27	14,307.34	8,349.29	5,954.44	1,017.88	197.76	.....
Per cent. of increase	51.80	71 98	40.19	483.02	414.70	.....	.....
Line per 100 square miles of territory	20.93	13.79	8.02	5.72	0.98	0 20	.....
Line per 10,000 inhabitants	26.60	20.47	14.64	12.90	2.90	0 71	.....
Group IV: Number of miles of line	9,032.08	4,691.42	3,013.33	2,650.37	958.43	650.58	10.00
Per cent. of increase	92.52	55.69	13.69	176.53	47.32	6,405.80	.....
Line per 100 square miles of territory	6.29	3 27	2.10	1.85	0.67	0.45	.....
Line per 10,000 inhabitants	17.41	10.36	8.75	8.05	3 24	2.51	0.04
Group V: Number of miles of line	18,635.09	8,567.61	7,596.27	5,257 43	1,123.64	86.75	.....
Per cent. of increase	117.51	12.79	44.49	367.89	1,195.26	.....	.....
Line per 100 square miles of territory	6 36	2.93	2.59	1.80	0.38	0.03	.....
Line per 10,000 inhabitants	21.52	11.58	13.15	10.07	2.58	0.26	.....
Group VI: Number of miles of line	37,463.44	22,475.27	9,705.42	4,380.20	107.00	.....	.....
Per cent. of increase	66.69	131.57	121.57	3,993.64	.....	.....	.....
Line per 100 square miles of territory	9.52	5.89	2.54	1.14	0.03	.....	.....
Line per 10,000 inhabitants	36.55	28.92	16.44	11 56	0.62	.....	.....
Group VII: Number of miles of line	8,886.93	2,541.90	35.34	.....	.....	.....	.....
Per cent. of increase	249.62	7,092.70	.....	.....	.....	.....	.....
Line per 100 square miles of territory	2 35	0.65	.....	.....	.....	.....	.....
Line per 10,000 inhabitants	68.65	48.54	2.30	.....	.....	.....	.....
Group VIII: Number of miles of line	20,355 20	7,600.38	3,959.93	656 27	.....	.....	.....
Per cent. of increase	167.82	91 93	503 40	.....	.....	.....	.....
Line per 100 square miles of territory	5.75	2.14	1.12	0.22	.....	.....	.....
Line per 10,000 inhabitants	40.58	22 00	19.33	4.78	.....	.....	.....
Group IX: Number of miles of line	9,854.18	3,041.04	661.40	382.18	46 48	20.75	.....
Per cent. of increase	224.04	359 79	73.06	722.25	124.00	.....	.....
Line per 100 square miles of territory	2.59	0.80	0.17	0.10	0.01	0.05	.....
Line per 10,000 inhabitants	28.56	11.67	4.13	2.79	0.60	0.59	.....
Group X: Number of miles of line	12,160.37	4,788.25	1,577.98	21.90	.....	.....	.....
Per cent. of increase	177.11	178.09	8,105 39	.....	.....	.....	.....
Line per 100 square miles of territory	1.61	0.56	0.21	.....	.....	.....	.....
Line per 10,000 inhabitants	52.28	30.51	18.28	0.42	.....	.....	.....

Railroading in Ireland.

We ran fast enough between stations, but would loaf from five to ten minutes every time we stopped. At one long stop where the driver took water and told me a five-act story, and the stoker oiled around, I heard an old fellow in the car next the engine say: "Tha dhriver has shtopped to bile the wather agin; I wonder phy they don't bile it runnin', like they do in England."—*Locomotive Engineering.*

Signaling at Waterloo Station, London.

WITH AN INSET.

The rebuilding of the interlocking signal plant at the Waterloo terminus of the London & Southwestern Railway in London has been heretofore noticed on various occasions in the *Railroad Gazette*. This station is claimed to be the largest and certainly is one of the largest in the world. The approach to it has six main track, and 879 trains or engines have been handled here on a single day. The new signals have been made and erected by Messrs. Stevens & Sons, one of the oldest signal firms in the world, and the electrical apparatus has been made under the direction of Mr. W. R. Sykes, the inventor of the best known electrical locking for block signals, and whose name is well known in America.

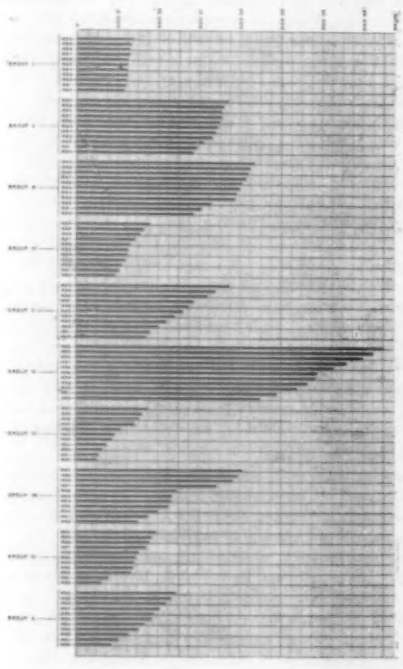
Although we have printed a diagram of the yard and some accounts of the apparatus, we give considerable space in this issue to the greater part of a detailed description, more complete than any which has heretofore appeared, by Mr. A. W. Szlumper, Member of the Institution of Civil Engineers, and printed in the Proceedings of the Institution, Vol. 91, part I. Some of the paragraphs are slightly condensed, but the descriptions of apparatus are copied practically verbatim. American readers who are not familiar with English usuage should, in order to read this description with satisfaction, keep in mind the meaning of certain terms. The signal tower or cabin is always referred to as a "box." "Road" is the common term for track. "Bay" is used to indicate a track alongside of a passenger platform. For movements away from the station, the word "out" or "down" is used, the latter being the usual appellation all over England, for tracks on which trains move away from London. Likewise "in" or "up" is used for trains moving into or towards Waterloo station. "Right away" is the familiar term equivalent to the American "all right," meaning a signal for a train to proceed to the next station in distinction from a signal to move forward a short distance. In studying the diagram it is necessary to remember that trains run to the left, not to the right, and that signal arms are on the left of the post, contrary to the usual practice in America.

One of the most interesting differences between these signals and American practice is the arrangement of the arms on the posts, as indicated in paragraph 3. The principle that each arm on a bridge should be immediately above the track it governs seems to be disregarded to a considerable extent, and the arrangement of arms in the same order, from bottom to top, as the tracks lie, from left to right, is apparently not applied at all. The American custom is that the arms indicating diverging routes from a single track shall all be on the same post, but no such rule obtains at Waterloo, apparently.

Previous to 1867 this yard had ordinary switches, with one distant signal, not interlocked. Every train was stopped outside the station, the engine detached and the train roped in. In March, 1867, Stevens & Sons erected a 47-lever locking frame and in 1874 a new 109-lever frame was added by Saxby & Farmer. In 1878 a larger signal box was built, incasing the one then existing and an additional row of 35 levers added by Stevens & Sons. Eighty-five levers were added in 1880 and 1885, making 209. On the completion of the fifth and sixth main tracks, the plant now described was built and all the old apparatus taken out. The main cabin, designated "A" box, rests on girders, over the northernmost main tracks, the girders themselves spanning all the tracks. The box is 30 × 74 ft., a mess room and a battery room taking up about one-fifth of it.

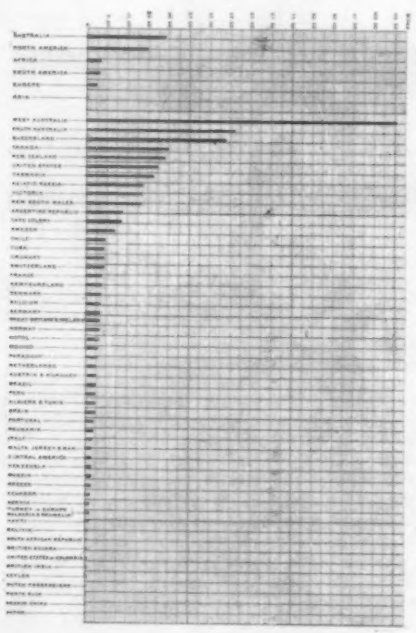
* The simplex selector was described June 24, 1892.

Territorial Groups Used by the Interstate Commerce Commission and Eleventh Census



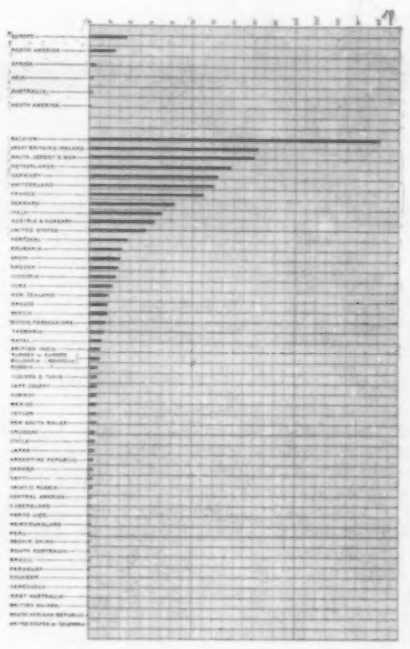
United States—Miles of Railroad by Groups, Each Year, 1880–1890.

APPROXIMATE SCALE: 1 *in.* = 20,000 *miles.*



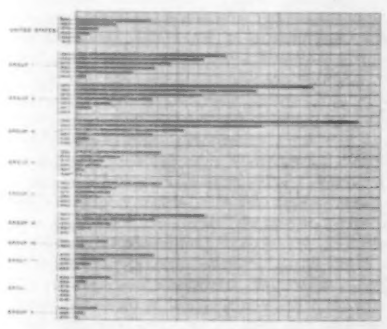
The World—Miles of Railroad for Each 10,000 Inhabitants.

APPROXIMATE SCALE: 1 *in.* = 50 *miles.*



The World—Miles of Railroad for Each 100 Square Miles.

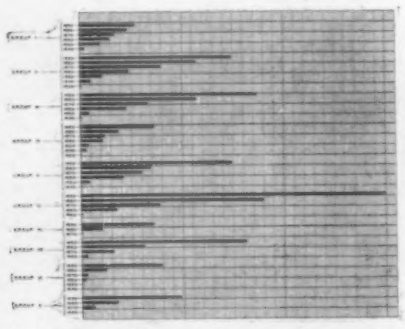
SCALE: 1 *in.* = 16 *miles.*



United States—Miles of Railroad for Each 100 Square Miles.

Shows changes by decades, 1830 to 1890, for the whole country and by groups.

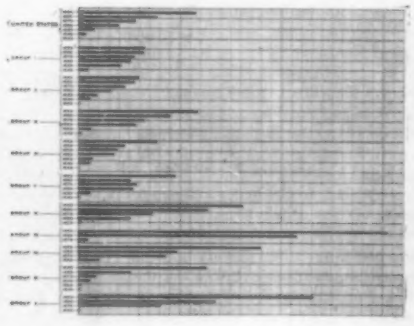
APPROXIMATE SCALE: 1 *in.* = 12 *miles.*



United States—Miles of Railroad for Each 10,000 Inhabitants.

Shows changes by decades, from 1830 to 1890, for the whole country and by groups.

SCALE: 1 *in.* = 36 *miles.*



United States—Miles of Railroad by Groups, Each Decade, 1830–1890.

APPROXIMATE SCALE: 1 *in.* = 20,000 *miles.*

COMPARATIVE VIEW OF THE RAILROADS OF THE UNITED STATES AND THE WORLD, IN ACTUAL LENGTH AND RELATIVELY TO POPULATION AND AREA.

The principal drawing is that showing the arrangement of tracks and signals, which is the largest one on the inset. Fig. 1 is reproduced from an article in *The Engineer* of July 29 last, and shows the arrangement of the two rows of levers in the cabin and of the interlocking troughs beneath the floor. As will be seen by the drawing, large trap doors are provided by which easy access to the interlocking is had at all times.

1. The new box contains 236 levers. There are 102 signal-levers, working 247 connections; 50 point-levers, working 81 points; 46 facing-point lock-levers, locking 68 points; 7 gear levers, for adjusting the triple working; 16 small setting-levers and 15 spare levers, all interlocked for and actually accomplishing the work of 350 levers. The levers are 8 ft. in length, fixed in two parallel rows 12 ft. 8 in. apart when in their normal position. The levers are 4½ in. from centre to centre throughout, excepting two spaces of 2 ft. 6 in., one in each row, to afford the signal-men more ready access to the windows of the box, and at the same time to divide the Windsor from the main-line levers. The levers are worked b

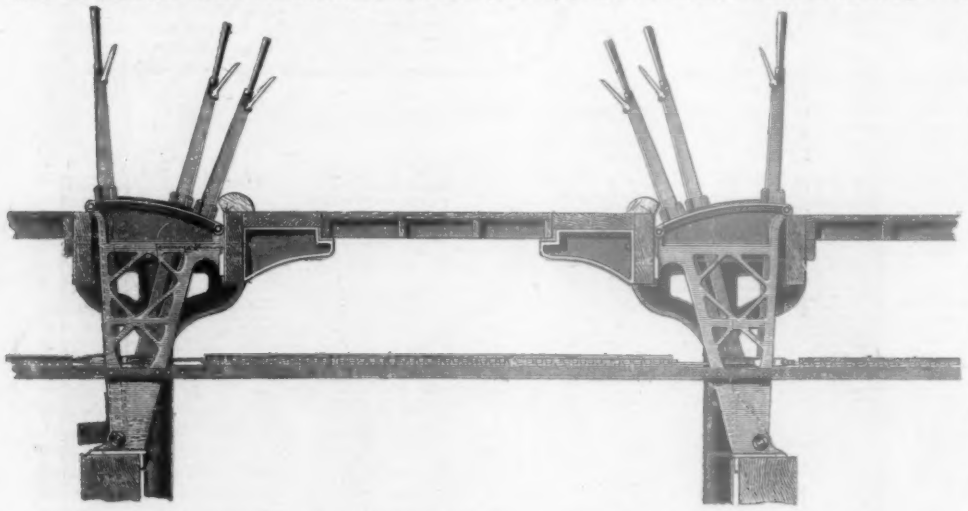


Fig. 1—Arrangement of Levers in "A" Box—Waterloo Signal Station, London.

the signal-men who stand between the rows. One row of men face west and the others face east. The interlocking is accomplished in three wide cast-iron horizontal locking troughs, beneath the floor, running from end to end of the apparatus—one in the centre between the rows of levers, containing 51 channels or grooves in which the interlocking mechanism is placed, and one on each side, between the levers and the windows to the box, containing 80 channels. Two long tappets are used, attached one on each side of each lever, connected by links imparting a horizontal movement to the tappets, which are provided with the necessary bevel notches, etc., to give motion to the locks and slides running in the grooves of the locking trough at right angles to the tappets. All the necessary facing and trailing points, and also the facing point locks have to be set before a passenger train signal can be lowered; in addition to this, special "rotation locking" is provided for each route, locking the route after the signal has been replaced to "danger" until a particular facing point lock lever has been returned to its normal position (generally the central point lock of the route set); the act of returning this lever removes all the back locks. For instance, take road 7 to *A*, passenger out, gear lever 128 would be set to the first position; the signal man would then pull the following levers, viz., points 61 and 59, facing point locks 64, 63 and 60, and signal 121; this signal lever would be the first to be replaced, and, although replaced, all the other levers would still remain back-locked until facing point lock 60 had been put back to its normal position when the signal man would be able to replace the remaining levers in the usual manner.

2. Simplex apparatus. This was illustrated and described in the *Railroad Gazette* of June 24, 1892. Where it is used a route has three signals; one for trains in the normal direction, one for switching movements in that same direction and one for movements in the opposite direction, called in America "back-up" and in England "wrong-road" movements. A single lever pulls either one of these signals, and a "gear lever" selects which one of the three, according to the position in which the signalman places it. Furthermore this gear lever is so fixed as to perform this selecting office for a number of routes at once. For instance, levers 7 to 18 are controlled by gear lever 19 and thus work 30 signals.

Special three-position release labels and name plate, and triple electric repeaters, are provided to suit this complex working. By the adoption of this triple working, the locking apparatus is much reduced in size, and the distance the signalmen have to move about is also less; but the number of pulls is not reduced, the only difference being that the same lever answers for three distinct signals, instead of a separate lever for each. The 16 small setting levers are placed between the ordinary levers, and are for interlocking only where alternative routes to the same platform bay are provided.

3. *Signals.*—Fixed on the east side of the new box is an iron gallery resting on the girders carrying the one for each road, and nine arms referring to the down traffic, viz., six advance signals (three for right and three for wrong road), and three distant signals (the latter worked from the "*B*" signal box). Each of the bracket signals at the end of the platform bays has passenger train "starting," shunt "out" on right road, and shunt "out" on wrong road; the latter being indicated by a scissors-shaped semaphore (indicated by a figure like an hour glass), with a distinctive light (purple) at night. This scissors arm is a great improvement upon the old arrangement, as the same arm was then used for a "right away" and shunt to "wrong" road signal, a distinctive letter only being lowered over the arm for the latter; this was found unsatisfactory and liable to be mistaken. There is also an arm for arrival traffic, indicating by three positions

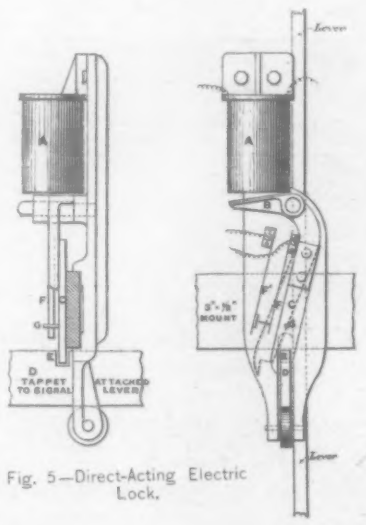


Fig. 5—Direct-Acting Electric Lock.

whether the bay about to be entered has a train already standing in it or is empty (each bay being large enough to take two trains). The working of these signals is described in paragraph 11. All these signals are electrically repeated inside of the "*A*" box.

4. The roads marked *A*, *B*, *C* and 1 to 7 (at the end of the platform bays) are considered as main line territory, and those marked *D*, *E*, *F* and 8 to 18 as Windsor line territory, but, as will be seen, the numerous cross-overs permit many routes to be made outside these limits. All points are fitted with the ordinary point-locks, and, where possible, safety bars (detector bars) are provided.

5. *Sykes Locks.*—The Sykes electric lock and block has been adopted throughout, and specially arranged for terminus working. For the up trains, the first "A" box block section extends from the "B" signal box (a distance of 467 yds. toward Vauxhall) to the "A" box, and the second section from this box to the platform bays. For the down trains, the first section may be considered to extend from the platform bays to the advance signals on the Westminster Road signal-bridge (the mechanical locking of the platform bay signals and the automatic working of these advance-signals practically constituting this section); the second section extends to the "B" box.

6. The electric lock-and-block instruments in the "A" box, working in connection with the "B" box for all up trains, are shown in figs. 3 and 4. *A* represents four 7-in. permanent magnets (capable of supporting about 7 lbs each); *B*, a pair of small electro-magnets fixed to the poles of the permanent magnets; *C*, an armature connecting with a stop on *F*; *F* F^1 F^2 are lock blades (labels or tablets are fixed on these blades); *E* E^1, line springs; *G*, a small lever connecting with a crosshead on to *F* and F^2; and *H*, a rod leading to and actuating the auxiliary lock in the tappet (figs. 6 and 7). In its normal state the armature is not attracted to the magnet. The man in charge of "A" box having received from "B" box a bell signal warning him that a train is approaching, he pulls over the small lever *G*; this action raises the blades *F* and F^2, also the rod *H*, putting the lock in the tappet (fig. 7); it also pushes the armature against the magnet, which is now sustained by magnetic attraction, and the instrument is in a condition to be plunged. This is done and contact is made with the springs *E* E^1, completing a circuit to the "B" box instrument, and enabling "B" box to release the lever feeding this particular road. At the same time a click on blade *F* is pushed aside, when it drops and locks the plunger. A "train on" having been accepted from the "B" box, the switch *S* is placed over the plunger, breaking the circuit and causing the indicating arm over the "B" box instrument to show "danger." The instrument in "A" box is now locked, and remains so until the train passes over a mercurial contact treadle fixed to the rails near the "in" signal on the signal bridge, when a circuit is completed with the instrument, causing an opposing current to travel through the magnets, which neutralizes their attractive power, when the armature falls away, releasing the stop on *F* and allowing the rods *F* F^2 to drop; these actuate *H*, pushing it down and removing the lock in the tappet. The instrument now returns to its normal position. This instrument is a "double," or "sending and receiving" instrument.

7. In connection with the Sykes locking, the signal-levers are fitted with *auxiliary locks*. The signal-levers actuating signals relating to trains approaching Waterloo are provided with a direct acting electric lock, fig. 5. *A* is an electro-magnet, *B* is an armature actuating the lock *C*, *D* is a tappet fixed to the lever, having a notch at *E*; *F* F^1 are insulated springs, and *G* is an ebonite pin. The lock is normally in the notch in the tappet that locks the lever. When a circuit is made with one of the yard boxes, the magnet *A* attracts the armature, lifting the lock from the notch, when the signal-lever is released. These electric locks are disconnected for an "in" or "out" shunt movement—the action of setting the gear lever accomplishing this by lowering the tappet *D* free of the lock *C*.

The auxiliary locks fitted to the signal-levers that actuate the "advance" signals is a double lock, fig. 6; *A* is the lock hung on a mount *G*; *B* is a tappet fixed to the lever; *C* C^1 are notches in the tappet; *D* is a rod connecting with the lock-and-block instrument; D^1 is a rod tailed into a mechanical locking instrument (G^1, fig. 8); *E* is a shifting cam. In the operation of pulling over the lever, the cam *E* engages with the rod *D*, raising it; this locks the lock-and-block instrument, and also actuates the lock *A*, which now drops into the rear notch in the tappet. The lever thus becomes locked, and remains so until the train passes over a mercurial contact-treadle (close to the advance signal), completing a circuit with the lock-and-block instrument, releasing the rod *D* (*H*, fig. 3); this drops down, and the lock is raised from the tappet. The lever is now returned home, and the cam *E*, in the return motion, again raises *D*, locks the instrument, and causes the lock *A* to drop into the front notch; the lever is now again locked, and cannot be used until a circuit between the "B" box and "A" box is made; this is effected when the train reaches the former box. When the lever is pulled over, D^1 is pushed upward, and this locks the group of starting-signals by means of the mechanical locking instrument.

The lock on the starting-signal levers is very similar to the last described, excepting that there is only the front notch in the tappet, and the rod *D* is tailed into the mechanical-locking instrument (G^1, fig. 8). F, fig. 6, is a cross-head connecting a group of starting-signal locks. The lever does not become locked until it has been pulled and returned home, when the lock drops into the notch in the tappet by the action of the cam. This lock is removed after the advance signal has been used, by means of the mechanical locking instrument, fig. 8.

The auxiliary lock used on the "shunting" signal-levers is shown in fig. 7. *A* is the lock hung on a mount at *E*; *B* is a tappet fixed to the lever, having a notch *C* which is under the lock only when the lever is home; *D* is a rod connecting with the lock-and-block instrument (*H*, fig. 3). The lock is normally off, as shown, being held in position by the rod *D*. When the lock-and-block

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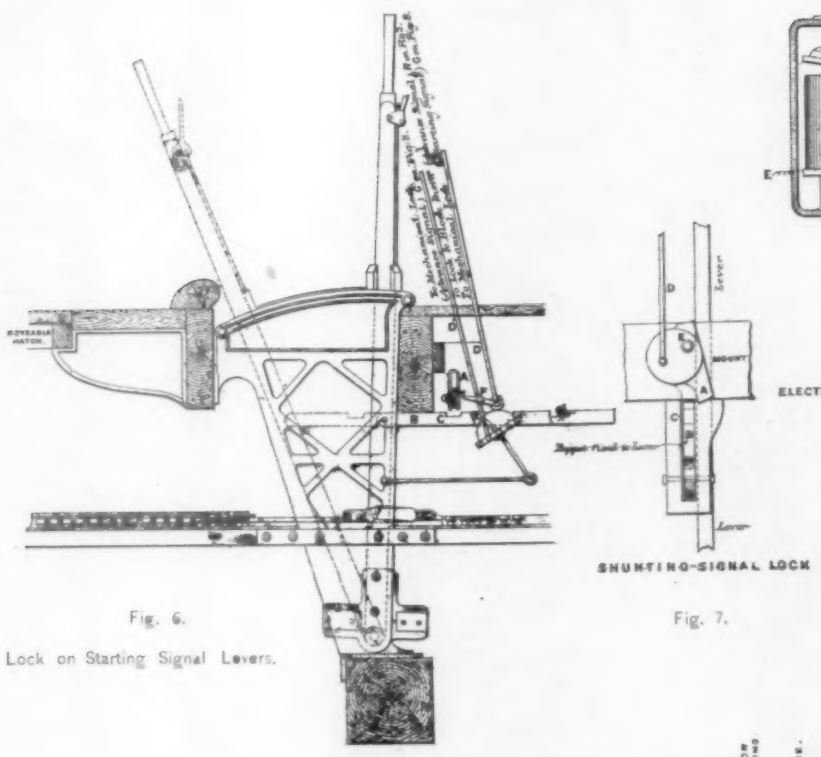


Fig. 6.

Lock on Starting Signal Levers.

Fig. 7.

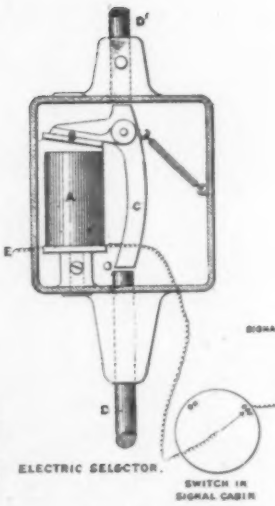


Fig. 10.

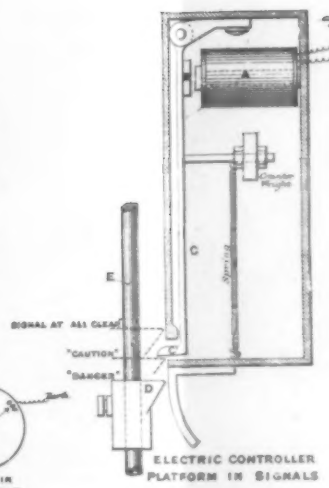
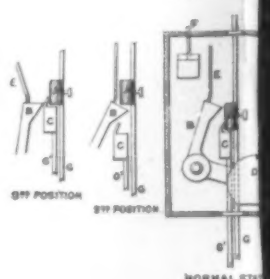


Fig. 11.

Fig. 8.



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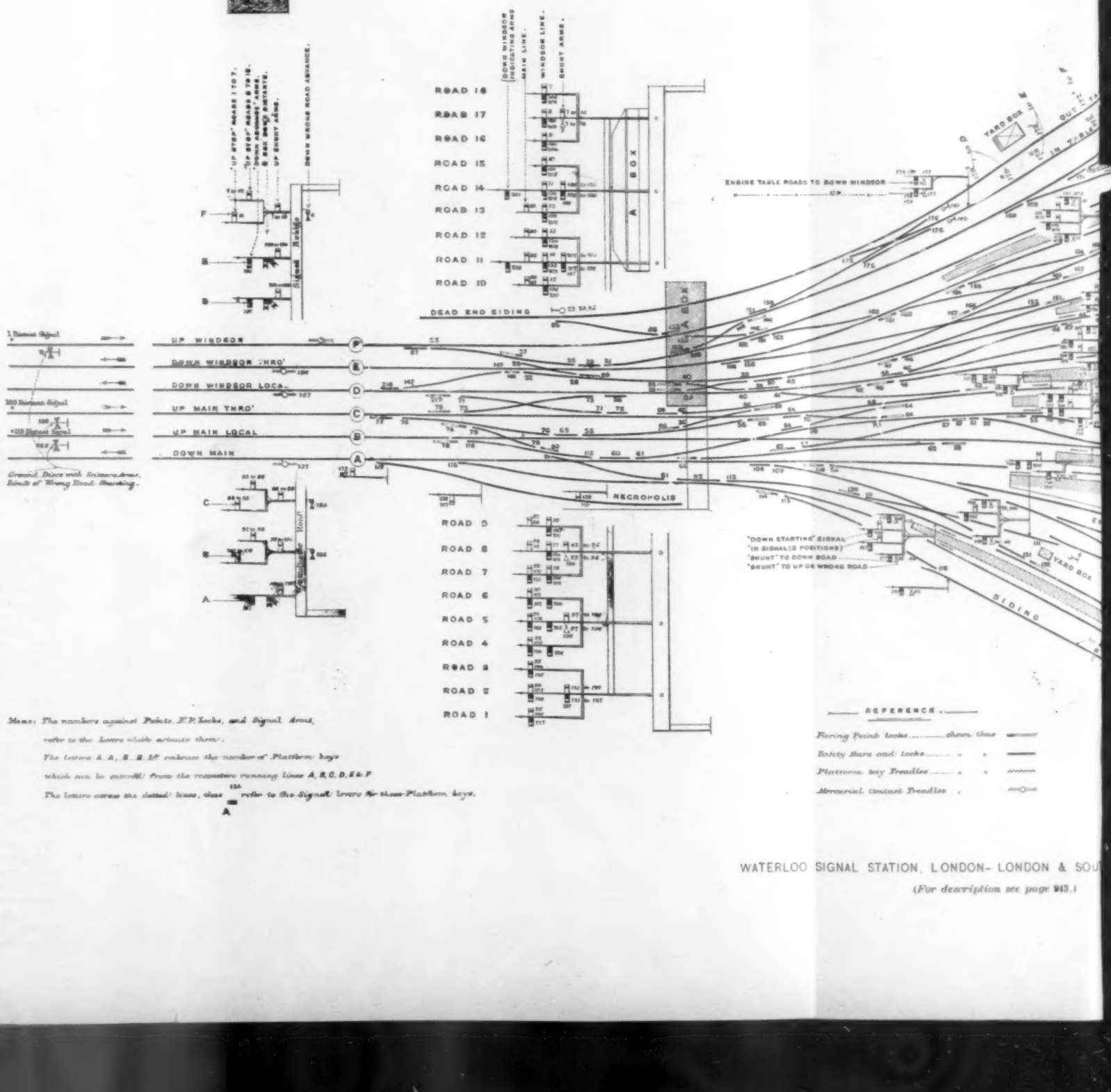


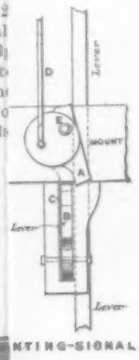
Note: The numbers against Points, F.P. Locks, and Signal Arms, refer to the Levers which actuate them.

The letters A, A, B, B, M embrace the number of Platform keys which are to extend from the respective running lines A, B, C, D, E & F

The letters across the dotted lines, thus $\frac{134}{A}$ *refer to the Signal Levers to these Platform keys.*

WATERLOO SIGNAL STATION, LONDON—LONDON & SOU

(For description see page 913.)



NTING-SIGNAL LOCK

Fig. 7.

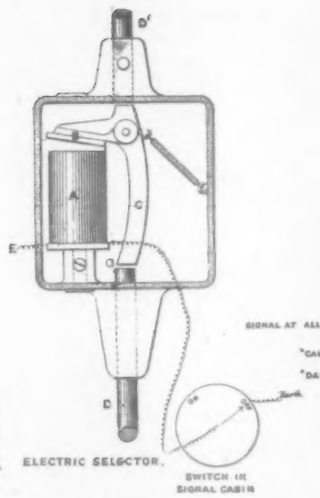


Fig. 10.

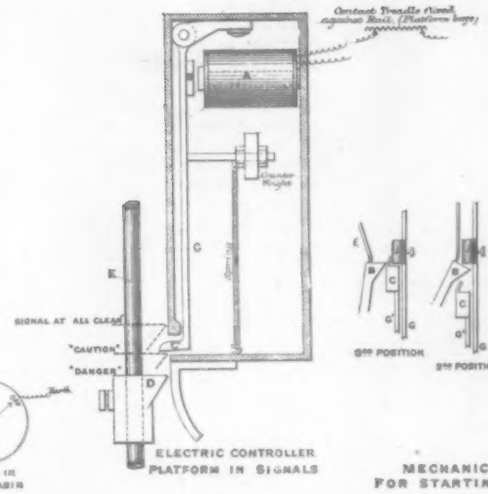
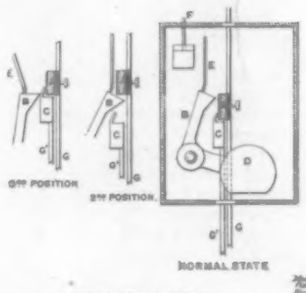


Fig. 11.

Fig. 8.



Scale, 1/8th Full Size for Figs: 7, 8, 9, 10, & 11.

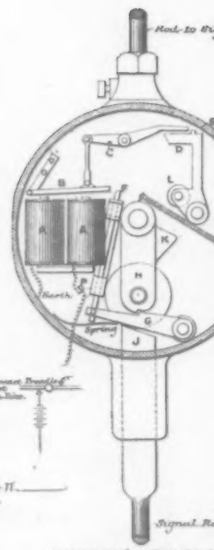
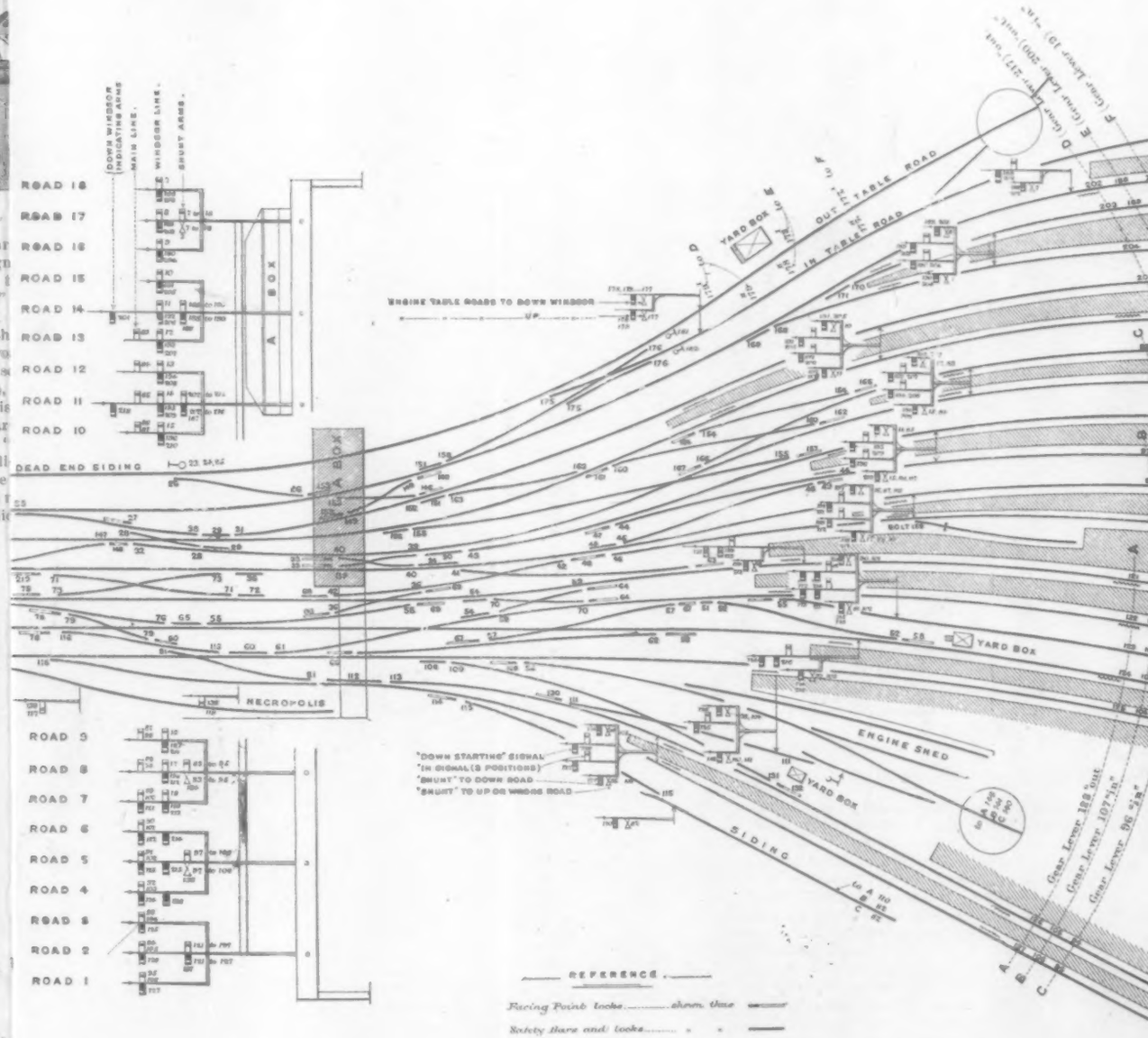


Fig. 9.



WATERLOO SIGNAL STATION, LONDON- LONDON & SOUTHWESTERN RAILWAY.

(For description see page 943.)

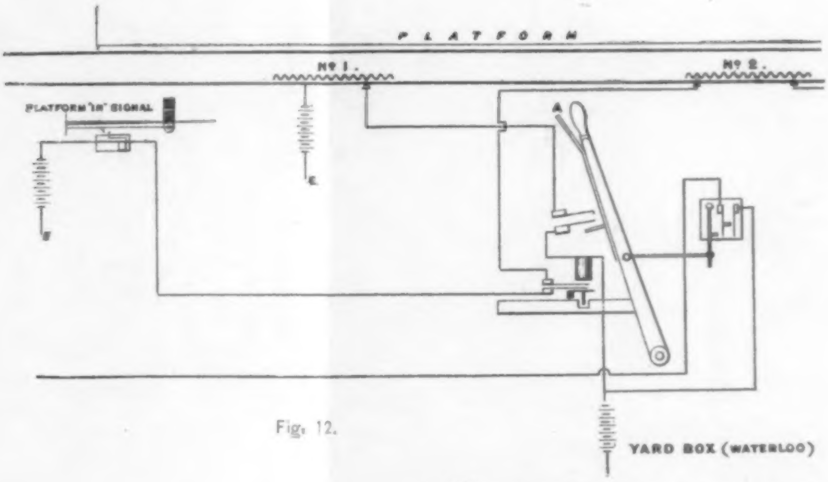
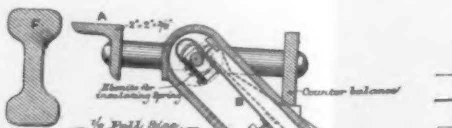


Fig. 12.



NOTE. A Bar, B Spring, C Brass contact cock, D Slate bed, F rail. When a vehicle passes, the flange of the wheels deflects A which actuates B, breaking contact with C.

Fig. 13.

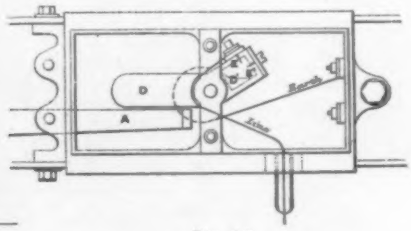


Fig. 14.

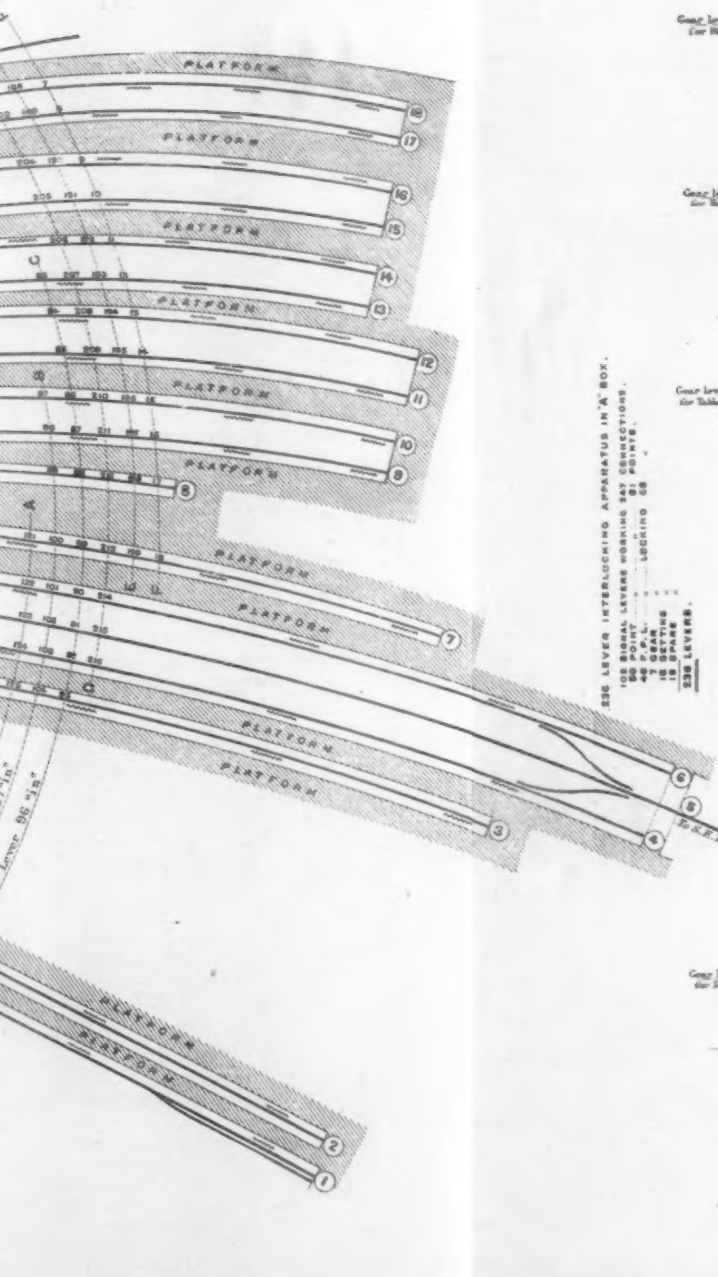
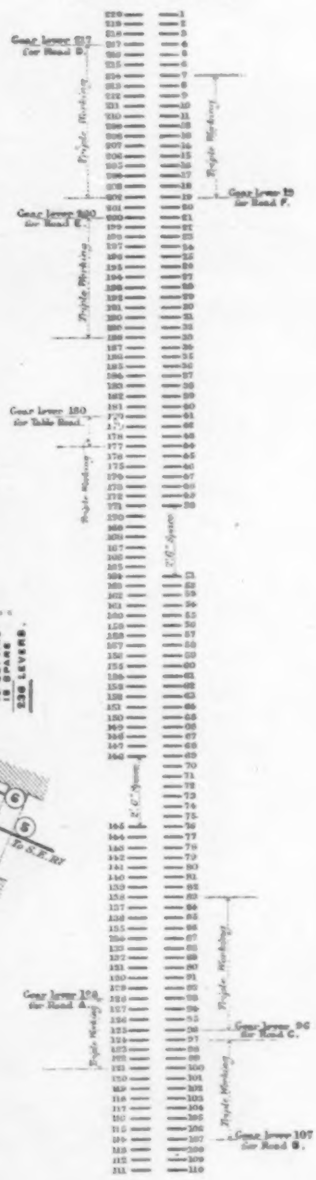


DIAGRAM OF LEVERS.



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instrument is in use, the lock *A*, fig. 7, is placed in the notch locking the lever; and when the lever is in use the lock-and-block instrument is locked, as the rod *D* cannot be moved; consequently, when any shunting operations on the "up" or wrong road, are in hand, it is not possible for "A" box to accept a train from "B" box on that particular road. All these auxiliary locks are entirely independent of, and in addition to, the ordinary locking.

Mechanical Locking of Group of Platform-Bay "Out" Signals.—The cross head *F*, fig. 6, is connected to *D*, which passes into a mechanical-locking instrument *G*, fig. 8, to which is attached a locking-piece *A*; another rod *D'*, fig. 6, connected with the "advance"-signal lever (belonging to this particular group of "out" signals) also enters this instrument, *G'*, fig. 8, terminating in a releaser *C*; *B* is a click, *D* a weight. When a starting signal is lowered, *A* travels upward, as shown in fig. 8, "2d position," and is held in position by the click *B* when the "advance"-signal is lowered, *G'* travels toward; *A*, pushing *B* aside and locking *A* by the releaser *C*, fig. 8, "3d position." The group of starting-signals are locked

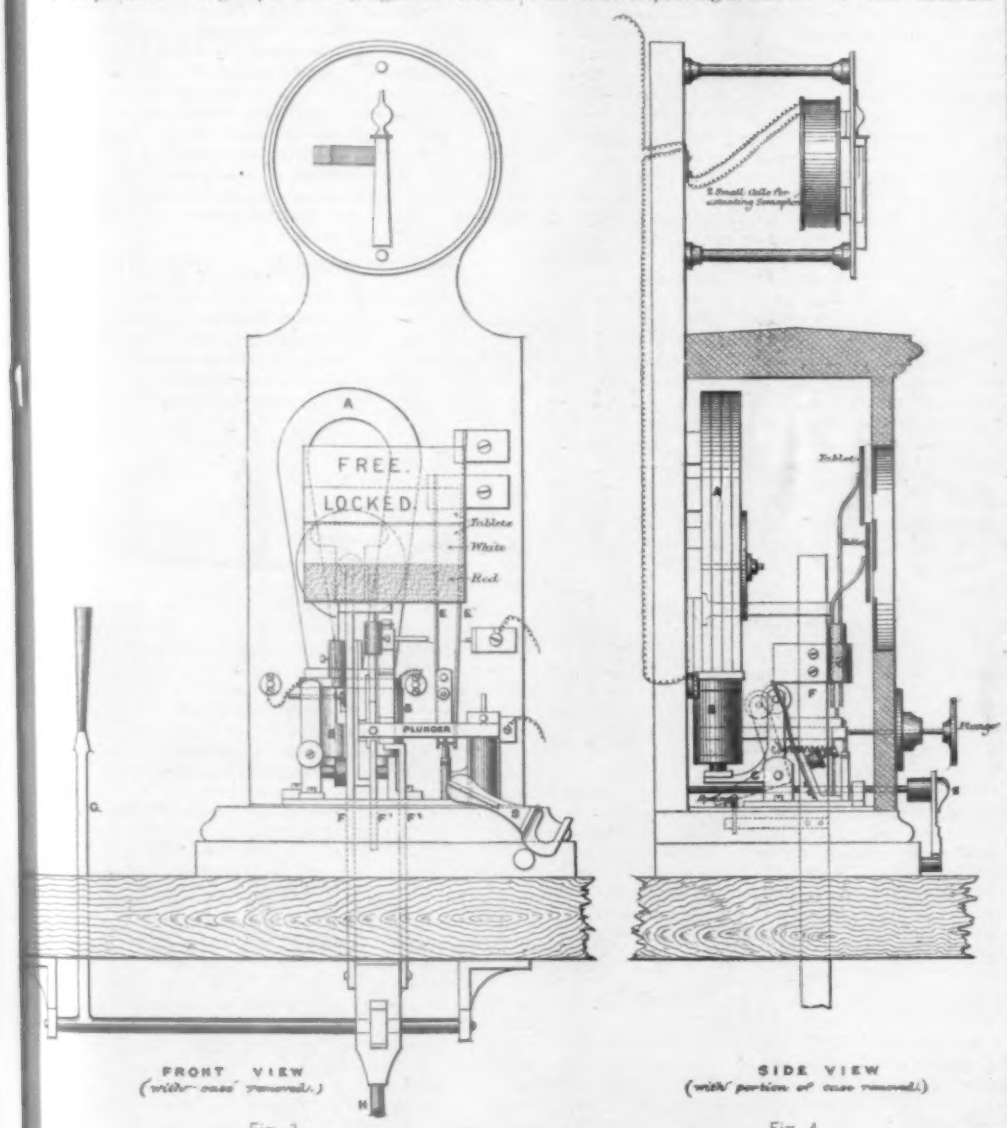


Fig. 3. Fig. 4.

Electric Lock and Block Instrument—Waterloo Signal Station.

until the "advance"-signal is returned to danger, when *G* is withdrawn, allowing *A* to drop back to its normal position. If a "starting"-signal has been lowered, and it is required to return it to "danger" before the train leaves the platform bay—this is accomplished by inserting a key at *F*, which actuates *E*, pushing back the click and allowing *A* to return; this, of course, would only be used in case of emergency, and before the "advance"-signal has been lowered.

9. *Electric Reversers* are used on advance starting signals, by which trains automatically throw the arm to danger as they pass it. The electric reversers are fixed to the signal-rods, and when the rod is raised (signal lowered) a pin *P*, fig. 9, projecting from the back of the reverser, comes into contact with an insulated spring fitted to the signal-post, through which a current is carried to a mercurial contact treadle fixed to the rails near the signal. *AA* are a pair of electromagnets; *B* is an armature actuating the link and cross-bar *C*; *D* is a hammer fitted with the stop *E*, which is locked by *C*; *F* is a pin connecting with the lock *G*, which holds a link *H* in position. Directly a train passes by the treadle, a circuit is completed to the reverser, exciting the magnets which then attract the armature *B*, releasing the stop *E* and allowing the hammer *D* to fall and strike the pin *F*, releasing the lock *G*. The weight of the reverser now causes it to drop, and in so doing it puts the signal to danger. As the reverser drops, the rod *J* pushes H aside, and a cam *K* engages with a wheel *L* fixed to the hammer, raising the latter and resetting it. When the signalman returns the signal lever home, *J* is withdrawn to its normal position and the reverser is reset. The advance and distant signals [on the same post] being slotted, the reverser actuates both at the same time.

10. The "in" shunting-signals on the Westminster Road signal-bridge work simultaneously with the "in" shunting signal on the "A" box, but the signal on the box can be lowered, keeping the one on the bridge to danger. Thus, if a light engine has been shunted out toward the signal-bridge, "A" box can lower the "in" signal above the box, keeping the one on the signal-bridge to danger. The engine now shunts back, and is protected from incoming trains by the signal on the signal bridge. This dual working is accomplished by an *electric selector* which is fixed to the signal-rod connecting the two signals, fig. 10. *A* is an electromagnet; *B* is the armature, connected with and actuating *C*; *DD'* is the signal rod joining the arm on the signal-bridge with the corresponding arm on the "A" box. In its normal state the selector is inactive, and the rod *DD'* is practically continuous, carrying the selector with it as it moves. Should the signalman wish to bring the selector into use, he switches on a current, and the electromagnet *A* attracts the armature, displacing *C* from the line of the signal-rod, so that when *D* travels *D'* remains inactive. The signal in the rear of the selector (on the "A" box) can be lowered, that on the signal-bridge remaining at danger.

11. *Electric Locking of Platform-Bays.*—The platform "in" signals are worked from the small yard-boxes, the position of the arms being electrically controlled by contact treadles fixed to one of the rails. Four such treadles are placed in each platform-bay. Two of them are shown in fig. 12. There is a circuit connecting the first bar with the levers in the yard-boxes, and, should any vehicle be standing on the bar, it would be depressed and the circuit broken; the electric lock could not under these circumstances be raised from the tappet attached to the lever actuating the "in" signal to this road, and it therefore remains locked. The other treadles are in circuit with the yard-box and platform "in" signals, passing through an electric controller fixed on the signal-post. Supposing all treadles free, the signalman, by the action of pulling lever *A*, fig. 12, joins circuits with the treadle, causing a current to pass through his magnet and raise the lock from the tappet, the act of pulling the lever over makes contact with a line-circuit to the "A" box (it also lowers the platform "in" signal). The electric lock on the lever in the "A" box can now be released and the signalman in his box is enabled to lower his "in" signal for this particular platform-bay. Should, however, either of the treadles Nos. 2, 3, or 4, be depressed, the circuit with the signal (through the controller) is broken, and, in consequence, the electromagnet in this controller is inactive, causing a trigger to engage with the signal-rod. *A*, fig. 11, is an electromagnet, *B* an armature connecting to a trigger *C* fitted with a foot *C'*. When the circuit is complete, the electromagnet attracts the armature, and the foot *C'* remains inside the iron case containing the controller; the signal-rod has then a free movement. Should, however, the circuit be broken, the electromagnet ceases to attract the armature, and, the trigger *C* falling away, projects the foot *C'*, engaging with the spur *D* on the signal-rod E, which can now only travel up far enough to lower the signal to "caution."

12. The *contact-treadles* fixed to the rails in the platform-bays are very simple, (fig. 13). The flange of a wheel depresses a bar which breaks contact by raising a spring; but these treadles are only suitable where trains pass over slowly; for situations where trains run at high speeds, mercurial contact-treadles, fig. 14, are used. The treadles are 6 ft. in length, and are bolted to the web of one of the rails. *A* is a lever 18 ins. in length, mounted on pins. *DD'* is a small iron vessel containing about a thimbleful of mercury at the end *D'* and solid at *D*; *EE'* are platinum points fixed in the vessel, *E* insulated and attached to a line-wire carried to the signal-box (and also to an electric reverser in the case of the "advance" signals); *E'* is connected to earth. When a train passes the treadles, the deflection of the rail moves the lever *A*; this tilts the mercurial vessel, when the mercury covers the platinum points, completing a circuit. There are two mercurial vessels to each treadle in case one fails to act.

13. When passing the treadle near the advance signal an outward train not only throws the semaphore to danger, but actuates a "buzzer" at "A" box, continuing until the signalman restores his lever, the signal being already put to "danger" by the action of the treadle.

14. For shunting out on the "up" road the movements are electrically controlled by "B" box; and, before permission is given to "A" box for such a shunt movement, the signalman at "B" box puts a lock into his up "stop" signals feeding the particular road on which the shunt-movement is about to be carried out. The limit of shunting out on the wrong road extends to a point near "B" box, where ground discs of scissors pattern are fitted.

15. The total number of circuits entering the new box is about 250; all the wires are carried under ground. The instruments used have been constructed so as to permit as far as possible the use of the Leclanché type of battery. The number of cells in the yard is about 683, the greater number being for repeating signals and bells. The rod connections are somewhat complex—double-tier rollers having to be resorted to. Annett & Wilmer's point rods and Stevens & Sons' traveling rollers are used. In all cases the signal wires are carried overhead.

The World's Supply of Nickel.

At the October meeting of the Engineers' Society of Western Pennsylvania, Mr. Joseph H. Eastwick read a paper under the above title. Nickel was first isolated by Cronstedt in 1751, and was noticed as a peculiar metal in the copper ores of Germany. Its applications in the arts have been developed within the last 50 years. While deposits of nickel ore are widely distributed over the surface of the earth and have been worked to some extent in many countries, the world's supply is derived from two extensive deposits; one in New Caledonia and the other at Sudbury in Canada. The Sudbury deposit is nickeliferous pyrrhotites and the New Caledonia is principally silicates of magnesia and nickel. The Sudbury deposit is propably the most extensive and important to be found anywhere, but the New Caledonia mines which were discovered about 25 years ago, still supply the largest part of the world's nickel. The deposits in Sudbury will, however, compete very seriously with the New Caledonia ores, as the company has now a large plant costing about $2,500,000, and has several mines which are doing very well. The average percentage of nickel in the Sudbury deposit is between two and three per cent.; that of the New Caledonia mines is from eight to 10 per cent. There are deposits at various places in the United States which may be valuable, principally in Oregon, Nevada and North Carolina. A trial of the North Carolina ore by Mr. Mixer, of the Edgar Thomson Steel Works, was rather discouraging. It averaged about two per cent. of nickel, although samples have been obtained running up to 10 per cent. The Nevada ores are abundant in quantity and comparatively rich, but they are arsenides of nickel and difficult to refine. They are also far from railroad facilities. The Oregon ores are of the silicate class and have not been developed in commercial quantities.

During the discussion the question of welding nickel and iron was brought up. Mr. Mixer said that he had examined rolled sheets made in Cleveland, O., of nickel and

steel. Looking at the edges of the sheet, it could not be determined where the nickel ends and the steel begins, but of course the outside is mostly nickel and the inside steel. The nickel is welded to both sides of a sheet of steel. It makes a non-oxidizable article having the stiffness of ordinary steel, and convenient for various uses.

Mr. Mixer pointed out that the small percentage of nickel used in steel is not likely to increase the demand for nickel so much as is generally thought. The Edgar Thomson people had received from Commodore Folger a bar of nickel steel containing 25 per cent. of nickel. It was about two inches in diameter and very tough, and a steel chisel was ruined trying to cut through it. It took a beautiful polish. It is obvious that for many purposes, as, for instance, pistol barrels, a steel with a high percentage of nickel may prove very valuable.

The Fisher "Combination" Rail Joint.

In our issue of Nov. 29, p. 879, in the report of the Roadmasters' Convention menti on was made of the good service of the improved Fisher joint on the Reading. This joint in its latest form is shown in the engravings In describing it we necessarily repeat some facts that have long been well-known about this joint.

The rail ends rest in their full width directly upon the central and highest part of the long flanged beam, which is slightly arched upward to bring that support at the extreme end of the rails, and for equal and simultaneous distribution of loads on the two joint ties. They are held down to it by the nuts and two ends of the U bolt, which pass vertically through it and through the corners of the rail flanges previously clipped out for that purpose. Under the nut on each side is an angular "forelock" and fish bar, combined in one piece, filling horizontally the entire space between the stem of the rail and the enclosing flange of the supporting beam, its under part accurately fitting upon the upper surface of the rail flanges. This is the new feature. These forelocks extend vertically and in close contact with the rail stems on each side, but do not reach to the head. They are secured horizontally by bolts through them and the stems metal to metal, thus effecting the fishing in that direction. and they maintain perfect line without movement or wear.

The Fisher Combination Joint.

When also the U-bolt ends (1 in. in diameter) are screwed up, the rails are fixed both vertically and laterally in the same planes. The slight wear between any of the surfaces in contact can be taken up directly by the respective bolts and nuts. A heavy elliptic steel spring-bearing piece is provided for the lower part of the U-bolt.

The channel beam is proportioned to carry all the load of the heaviest wheel at the highest speed. The U-bolt restrains the upward vibration of the rail extremity as the wheel approaches or recedes. The frequent tearing apart of the upper edge of angle bars shows this upward strain to be very great in heavy steel rails.

A Bill to Legalize Pooling and Modify Penalties.

Senator Cullom presented in Congress, on Tuesday, a bill to make the following amendments to the Interstate Commerce law.

"Amend section 5, so as to read as follows:

"'SECTION 5. That it shall be lawful for any common carrier, subject to the provisions of this act, to enter into contracts or agreements with other common carriers, having for their object the establishment and maintenance of just and reasonable rates, and the prevention of unjust discrimination. Such agreements may provide for the apportionment of traffic or of earnings, and shall be enforceable between the parties thereto. Copies of all such agreements shall be filed with the Interstate Commerce Commission at least ten days before the same become effectual. The Commission shall have power, after hearing the parties interested, to order the cancellation of any such agreement between different and competing railroad companies, the purpose or effect of which shall be to establish transportation charges above rates which are reasonable and just, or to cause unjust discrimination between persons, localities or different descriptions of traffic, or which shall be otherwise in contravention of any of the provisions of this act. The foregoing provisions of this section shall not be construed to relieve such common carriers from other provisions of this act, nor to affect the jurisdiction or authority of the Commission or of the courts conferred by this act.'

"Add to section 10 of the same act the following clause:

"'Whenever any common carrier, subject to the provisions of this act, is a corporation, such corporation may be prosecuted as for a misdemeanor under any of the foregoing provisions of this section, and upon conviction shall be subject for each offence to a fine of not exceeding $5,000.'

That so much as said section 10 as provides for punishment by imprisonment is hereby repealed; and no person shall be excused from testifying in any criminal case or proceeding under this section on the ground, or for the reason that his testimony might tend to criminate or implicate himself, but such person shall not be prosecuted or subjected to any penalty or forfeiture for or on account of any transaction, matter, or thing concerning which he may thus testify; except that this provision shall not exempt such person from prosecution and punishment for perjury committed in testifying as aforesaid."

On Wednesday Senator McMillan introduced another bill of similar import, the chief difference being that the parties to the pool are required to deposit a sum of money to guarantee faithfulness.

On Wednesday the Cullom Bill was the subject of a hearing before the Senate Committee, at which arguments in its favor were made by Presidents Roberts, o the Pennsylvania; Depew, of the New York Central, and Ingalls, of the Cleveland, Cincinnati, Chicago & St Louis; and by Hon. A. F. Walker.

Pullman Dining Car Service on the Pennsylvania Lines West of Pittsburgh.

The arrangement of Pullman dining cars on the Pennsylvania system west of Pittsburgh is interesting, both on account of the complete service rendered and the long runs which are made by some of the cars. The New York and Chicago Limited is served by one car, which leaves Chicago at 5:00 p. m. and runs to Fort Wayne, arriving there at 8:50 p. m. and returns to Chicago on the westbound Limited the next morning, arriving in Chicago at 9:45 a. m. Trains Nos. 20 and 22 on the New York and St. Louis lines are served on the St. Louis end of the run by three cars. According to the schedule a car leaves St. Louis at 8:10 a. m. and runs to Newark, O., arriving there at 9:25 p. m., and leaves on the return trip at 5:55 a. m., arriving at St. Louis at 7:00 p. m. While this service could be accomplished with two cars, three are used, giving a lie-over of about 37 hours at St. Louis to give a better opportunity to clean the cars and serve the lines in case of accident or delay. Another comparatively short service is that on the train leaving Chicago at 10:45 a. m. and arriving at Alliance, O., at 9:20 p. m., the dining car leaving Alliance on the return trip at 4:00 a. m. the next morning and arriving at Chicago at 3:00 p. m. This service is readily accomplished by means of two cars.

The most interesting feature of the whole service is that shown in the following schedule, in which the route of a dining car is shown from the time it leaves Chicago until it returns, after having been gone about five days:

Leave	Chicago,	Train No 8,	3:15 p. m.
Arrive	Fort Wayne, Ind		7:45 p. m.
Leave	Fort Wayne,	Train No. 4,	5.15 a. m.
Arrive	Alliance, O.,		2:10 p. m.
Leave	Alliance, O.,	Train No. 6,	3:15 p. m.
Arrive	Altoona, Pa.		10:40 p. m.
Leave	Altoona,	Train No. 11.	5:40 a. m.
Arrive	Richmond, Ind.,		7:25 p. m.
Leave	Richmond,	Train No. 6,	7:15 a. m.
Arrive	Pittsburgh,		5:50 p. m.
Leave	Pittsburgh,	Train No. 9,	7:10 a. m.
Arrive	Chicago,		9:30 p. m.

The car then ordinarily lies over in Chicago until 3:15 p. m. on the second day after. For this service six cars are used, the car lying over at Chicago serving as a reserve in case of emergency on any of the Pennsylvania Line trains out of Chicago. It will be seen that the stops excepting at Chicago are comparatively short, and that a car on this run serves three meals a day from the time it leaves Chicago until its return. In all, twelve cars are used for dining car service as above outlined.

The Vienna-Buda-Pesth Electric Railroad.

Under the head of "High Speed Electric Railroads" the *Schweizerische Bauzeitung* gives, among other things, further particulars of the much talked of electric railroad which is to be built between Vienna and Buda-Pesth, and on which a speed of from 125 to 155 miles an hour is to be realized. In addition to what has already been said of the project at different times in *The Railroad Gazette* the following may prove interesting.

The project, it may be remembered, was put on foot by the firm Garry & Co., of Buda-Pesth, and in developing the plans it was concluded to operate the road by running a large number of short, light trains or single cars, rather than a comparatively small number of long and heavy trains, the traffic interests being served best by the former, and the engineering difficulties also being less with that arrangement. It was agreed that with the large number of short trains or single cars on different parts of the line there would be a more uniform distribution of the power over the whole length; that with the lighter train-weights, smaller electric motors would suffice, that there would be a smaller demand for power per train, and that greater simplicity and cheapness could be secured in the distributing mains. With the smaller train-units, in fact, every requirement of satisfactory service was held to be much more easily met.

For the generation and transmission of the electric current it is proposed to establish two large stations, about 37 miles distant from the two terminals, and to use aerial transmitting lines. An alternating current of 10,000 volts is to be employed and is to be transformed to a current of lower voltage in a number of converter stations along the line. The cars are to be about 148 ft. long, 7 ft. wide, and 7.2 ft. high, with parabolic ends to reduce air resistances. Each car is to rest on two radial trucks, and each of the four axles is to have an electric motor.

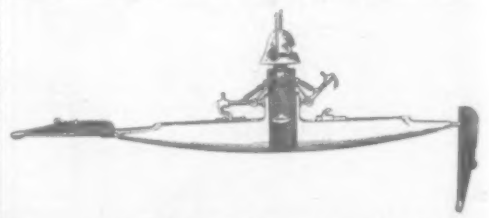
Between the rails there are to be two conducting rails, and the current is to be taken from them by two grooved contact wheels on each car, affording a large contact surface. These contact wheels are to be made of comparatively large diameter so as to reduce their rotary speed, and are to be mounted centrally in each of the radial trucks. Springs are to be used to keep them in contact with the conducting rails.

Brake power, a most important requisite at the contemplated high speeds, is to be furnished by a Westinghouse brake on each car, and by the electric motors themselves which, when desired, can be made to work as primary machines, generating current.

In building the line, there are to be no radii of curvature less than 3,000 metres (9,840 ft.). The rails are to be 7.2 in. high, and will weigh about 91.5 lbs. per yard. They are to be bolted to steel cross ties, spaced one meter from centre to centre, and the ties themselves are to be laid on a béton foundation and firmly secured to it. The conducting rails will be carried in cast-iron chairs on porcelain insulators, the latter being secured to the steel cross ties. There is to be a double track throughou without switches, and, because of the strong air current likely to arise from the high train speeds, the tracks are to be not less than 32.8 ft. apart. The tracks are to be run along viaducts after the Monier system, and there are to be no grade crossings whatever. It has been calculated that each car, representing a load of about 60 tons, will require about 800 H. P. as a maximum. The transformed current will have a voltage of 1,000, making a maximum ampérage of about 600 necessary for each car.

The Johnston Disconnector for Trolley Wires

The disconnector shown in our illustration is intended to render a broken trolley wire harmless by breaking the circuit as soon as the wire breaks. When the wire is intact, and so under tension, the ends of the disconnector are kept in a horizontal position as shown on the left of the illustration, but if the wire breaks the end of the



disconnector drops with the falling wire, and as the tension is removed the catch shown in the figure is lifted, thus breaking the circuit and making the falling wire perfectly harmless. The device can of course be applied equally well to electric light wires or to any other wires which may become dangerous when broken. This device is handled by the Johnston Safe Automatic Electric Co., of Richmond, Va.

The Outlook for British Engineers.

At a meeting of the the Institution of Civil Engineers held Nov. 8, Mr. Harrison Hayter, the new President, departed somewhat from the ordinary course of presidential addresses. Instead of taking up a special topic, he chose to run over the field and make some estimate of the important works that are likely in the future to be undertaken by British engineers at home and abroad.

He considered first the channel tunnel. Valuable and extensive investigations have been made, and a route recommended by Mr. Hayter and his associates. This route leaves the English coast about four miles northeast of Dover, and reaches the French coast about six miles southwest of Calais. The line is straight. The submarine tunnel would be about 21 miles long, and the total length with approaches and connections about 35 miles, The maximum depth of water in the channel is 180 ft., and the depth from the bed of the sea to rail level would be not less than 200 ft. The tunnel would go through the lower chalk, and there would be no faults that would affect seriously the continuity of the strata. Another company, the Channel Tunnel Company, is exploiting a tunnel on a different line of about the same physical characteristics. Ms. Hayter thinks that this tunnel would cost not more than £10,000,000. He thinks that a bridge across the channel may be dismissed for the present at least, for it would cost at least five times as much as a tunnel.

Mr. Hayter considers also a tunnel between Scotland and Ireland, a project which is likely to receive a good deal of attention. The distance from the Scotch coast to the Irish where the tunnel will probably be driven, is, within a mile or two, the same as between the English and the French coasts. Some of the routes that have been proposed for the Irish tunnel would go under a ravine in the sea bed about six miles from the Scotch coast called Beaufort's Dyke. This ravine is three miles wide at places, and has a maximum depth of water of 900 ft. Mr. Hayter and Mr. Barton propose to pass around the northern end of the Dyke where the maximum water is 500 ft. On the Scotch side the tunnel would go through the Lower Silurian rock, and on the other side the red marls which overlie the new red sandstone. The first

formation exists for about one third of the way and the other for the remaining two-thirds. The tunnel would be in no place less than 150 ft. below the bed of the sea.

The risk attendant upon either of these tunnels is simply that of the possibility of sea water entering in quantities too great to be overcome. Apart from this the work would be merely a question of time, but the risk could be ascertained probably by sinking land shafts which would form part of the permanent work and driving driftways. The loss, if any, would be limited to the cost of the shafts, or in an extreme case to the cost of the shafts and driftways.

Other sub-aqueous tunnels will probably be built. One is to connect the railroads north and south of the Humber by a tunnel under that river. Another is a tunnel under the Thames to serve the railroads on either side; this one would be about 1¾ miles long. Another one that has been contemplated, is to connect the railroads of the Isle of Wight with the London & Southwestern. It is not improbable that all of these three tunnels will be built before long.

Mr. Hayter foresees a great deal of work on the British Islands in improving the inland navigation systems. There are now 3,814 miles of inland navigation in the United Kingdom, of which 1,205 miles are owned or leased by 13 railroad companies. These railroad canals carry but one-quarter of the total tonnage carried on the canals of the United Kingdom. In various ways the railroads have obstructed the development of the water traffic, but there is a hope that the canals of the country will soon be placed on a more satisfactory footing, and that this will lead to the construction of many more works to improve and extend inland navigation. It now costs less to convey a ton of goods to India or Australia, for example, than to carry it from London by rail to Newcastle-on-Tyne, and the unsatisfactory canal service of England has enabled continental countries to carry coal and heavy goods so cheaply as to handicap British traders. Various projects are up for improving and enlarging existing canals. In general it may be said that the proposition is to make the depth of water from 9 to 12 ft., and to make the waterways of such width as to take barges carrying 400 tons and to work the traffic by steam power or cable traction, and in some cases to introduce lifts instead of locks. Mr. Hayter believes that within the next 50 years canal engineering and other improvements of inland navigation will furnish a great field for British engineers.

He points out the room for improvements in small harbors all around the coasts; for improvements in the dock systems, and for the improvements of rivers with a view to land drainage and to the mitigation of floods.

Another great question that will occupy engineers is that of water supply and sewerage. London, itself, offers an immense problem. Most of the water with which that vast city is supplied is taken from sources within the range of contamination; but the power of the water companies is so great, and their vested interests are so large, that the problem of bettering the water supply is extremely difficult. The manner of disposing of the sewage of the great towns is still crude, and there is a vast field for ingenuity and enterprise in that direction.

One of the greatest engineering questions of the day, is that of continuous rail communication from the Mediterranean to India. Mr. Hayter and his associates have been deeply interested for many years in establishing a rail route to India under British control. It is a question of immense importance to British interests. In 1888 Englishmen might have secured a concession from the Turkish Government to build certain railroads in Asia Minor, but the Germans got ahead if them, and are now building a line of about 300 miles from Ismid, about 60 miles from Constantinople, inland to Angora. Extensions of this line to the Tigris River will probably be made before long, and an obvious extension would be down the valley of the Tigris to the Gulf of Persia. Mr. Hayter urges that Englishmen and English capital should build a railroad from some point on the Mediterranean, either Suedia, or Alexandretta, or Tripoli to the valley of the Euphrates, thence down that river and along the Persian Gulf and the Arabian Sea to Kurrachee, where it would connect with the Indian railroad system. For the present the railroad need be built only to the head of the Persian Gulf, and the service continued thence by steamer to Indian ports. The saving in distance by this route would be more than 4700 miles to Bombay, and more than 1,000 miles to Kurrachee, over the present shortest route by the Suez Canal. The Euphrates Valley Railroad from the Mediterranean to the Persian Gulf would be about 850 miles long, and would probably cost about £8,500,000. It is estimated that a traffic would be had to pay 5 per cent. a year on this capitalization. Mr. Hayter says that the Mesapotamian regions contain vast sources of wealth, only requiring railroads to open them up, and we would suggest that this is a far more attractive field for British enterprise than the lake regions of Central Africa.

Mr. Hayter mentions other parts af Asia as opening up future work for English engineers as well as South America, Central America and Mexico. At this time his firm is carrying out at Buenos Ayres a great work. The whole city front, 3½ miles long, is being covered with docks. A channel 14 miles long, with a branch 16 miles long, is being dredged to bring ships to the docks, and the longer channel is now in use, though not yet finished. By these docks and new channels the country will derive a benefit of £1,000,000 a year in reduced charges. The completion of these works will lead to others, and it is already proposed to unite all the railroads which terminate at Buenos Ayres in a central station. This part of the address is closed by a brief review of the situation in Africa, and by a wish that some member of the Institution would undertake to write a consecutive history of a railroad system of the United Kingdom. In conclusion he says: "Our profession is full of vitality. Instead of being on the verge of finality, it is probable that the next 50 years will still witness a large development."

The "Soo" Canal and Lake Notes.

St. Mary's Falls Canal has closed after the greatest season in its history. The freight which passed through this year reached 11,241,000 tons, an increase of 2,335,000 tons over last year. Every important article of commerce shows great gains. Grain increased 61 per cent., flour 43 per cent., and iron ore 38 per cent. This will probably make the traffic of this canal about 3,000,000 tons greater than that of the Suez for the year.

Mr. C. P. Leland, the Auditor of the Lake Shore & Michigan Southern, has tabulated the course of the iron ore traffic at Lake Erie ports for 10 years, showing the receipts by percentages, for the *Iron Trade Review*, as given below:

	'83.	'84.	'85.	'86.	'87.	'88.	'89.	'90.	'91.	'92.
Ashtabula.	39.6	35.3	38.7	29.6	32.2	34.1	36.8	31.7	32.4	34.4
Cleveland.	42.7	40.1	39 2	45.6	35 4	25.7	26.2	28.3	25.5	29.2
Fairport...	2.4	1.3	2 1	4 9	14.6	16.2	15.6	15 9	14.2	13.0
Buffalo.....	2 4	0.5	0.5	1.4	0.5	6 3	5.6	8.0	8.3	2.9
Erie.....	6.3	6.3	8.0	4.0	8.1	6 3	5.5	7.1	7.9	9.7
Lorain.....	1.5	1.6	0 9	4.4	3.9	5.2	5.3	4 1	5.4	2.9
Sandusky,.	3.5	5.8	9.5	7.0	4.7	4.1	3.5	2.5	2 1	0.7
Toledo.....	.6	0.1	1 0	1.9	1.8	2.0	1.5	2.4	3.9	2.1
Huron.....	...	...	...	...	0.6	0.1	...	..	0.3	1 0

It is estimated that the ore movement by rail out of Ashtabula for this year will equal in tonnage that of a 6,000,000 bale cotton crop, or about the average crop of the South. The *Review* gives the following table, showing the shipments of iron ore by railroads from the lower lake ports in gross tons:

Dec. 1, 1887, to Dec. 1, 1888	3,493 935
Dec. 1, 1888, to Dec. 1, 1889	4,555,561
Dec. 1, 1889, to Dec. 1, 1891	5,587,685
Dec. 1, 1890, to Dec. 1, 1891	5,324,682
Dec. 1, 1891, to Dec. 1, 1892	6,019,772

A gain of over 72 per cent. is shown for the five years.

The Pennsylvania Railroad Company is nursing the trade of Erie. It has announced the determination to spend $2,000,000 on terminals at that city.

Ann Arbor No. 1, the car transfer boat that was aground near Ahnapee on its first trip from Frankfort to Kewaunee, has been pulled off and Ann Arbor No. 2, its consort has been launched from the yard of the Craig Shipbuilding Co., at Toledo. The New York *Times* has just discovered that these boats, "in two hours' time can be converted, in all respects, into harbor defense rams, and with a rapid-fire battery, well protected by steel shields, can justly be expected to silence any craft the British are able to send through the Welland or St. Lawrence River canals." All of which seems to strike those interested in lake shipping as "important if true." No one, however, doubts the newness of the information, though the boats were intended to ram ice.

The people of West Superior are elated over the fact that all of the steel used in the construction of the new whaleback World's Fair passenger steamer "Christopher Columbus" was made from Vermillion and Gogebic ore, smelted, converted and rolled in Superior City, and that not one plate was commenced before Sept. 5.

State Railroad Commissioners' Reports.

MAINE.

The Railroad Commissioners, of Maine, D. N. Mortland, A. W. Wildes and B. F. Chadbourne, have made the 34th annual report of the Board, for the year ending Nov. 30. The length of road in the State, June 30, was 1,385 miles. No serious accident has occurred to any train in the State during the year. Only one passenger has been killed and six injured. The Commissioners have examined the roads of the State, according to law, and report that they are being well cared for. More than a million dollars has been expended in repairs and renewals of tracks and bridges. The Board has sent out a circular requiring detailed information concerning the condition of all the railroad bridges in the State. There is a long chapter on safety brakes and automatic couplers, the conclusion being that State legislation can do no good, and that national legislation is likely to be useless. Considerable space is devoted to electric railroads and to the dangers incident to crossings established between these and other roads. Detailed accounts are given of the work on four new railroads in course of construction or lately completed.

MINNESOTA.

The statistical portion of the annual report of the Minnesota State Railroad Commission was submitted to the Governor Dec. 8. The total length of railroad in the State June 30, last was 5,616 miles, an increase of 88 miles over the preceding year. The taxes paid by the railroads for the year ending Dec. 31, last, amounted to $882,156, an increase of $139,080. The number of persons killed on the railroads in Minnesota during the year was 120 and of injured 809, being 30 and 208, respectively, larger than the records for the previous year. The number of employés in Minnesota was 22,782, an increase of 2,681 over 1891.

MICHIGAN.

Railroad Commissioner Whitman, of Michigan, has published his annual report for the year ending Dec. 31, 1891, including, however, the report of his inspections made during the present year. The Commissioner recommends that the law of 1883 imposing a tax on the gross receipts of sleeping cars be repealed, as it has not been possible to enforce it, and that a law similar to that in force in Pennsylvania be enacted in place of it. Several other recommendations are made concerning the laws, among which is one to strengthen the power of the Commissioner to enforce the abolition of grade crossings, to compel the use of interlocking switches and signals at crossings and to give the Commissioner jurisdiction over crossings of standard railroads with street railroads. Dangerous trolley wires are liable to to be stretched across railroads at insufficient heights The Commissioner thinks that the law of 1891, changing the method of taxation of certain railroads, is nugatory, in consequence of conflicting statutes. The reports of the companies show that the mileage of railroads in the state is 7,275 of which 141 consists of ore and lumber railroads. The length of road is 340 miles greater than in 1890 and maps have been approved of 250 miles not yet built. Some of the statistics of the report are as follows:

Number of track sections reported	1,277
Average length of same	5.69
Average number of men per section	2.9
Length of trestle replaced with earth - feet	6 619
Timber culverts renewed with stone or pipe number	220
Bridges, number	3,105
Bridges built during 1891	36
Railroad crossings at grade	310
Railroad crossings over or under	40
Highway crossings over or under	211
Highway grade crossings	7,222
Protected by flagmen, gates or automatic signals	195
Interlocking signal plants in operation	75
Employés on railroads in Michigan	26,838
Persons killed during the year	175
Persons injured	515
Taxes assessed for 1891	$854,334

Government Railroad Statistics for 1891.

The Statistician of the Interstate Commerce Commission has completed his report for the year ending June 30, 1891. It is not yet in print, but he has given to the press a summary of its main features.

In the United States on June 30, 1891, there were 168,402 miles of railroad. The length of track was 216,149 miles. The length of road per 100 miles of territory, exclusive of Alaska, was 5.67 miles, and per 10,000 inhabitants 23 29 miles. The increase in mileage during the year was 4 805 miles. The greatest activity in building was in the states lying south of the Ohio and east of the Mississippi rivers, the total being 1,670.63 miles. The tendency toward consolidation is clearly indicated by the report. On June 30, 1891, there were 42 companies, each of which controlled a mileage in excess of 1,000 miles, and nearly one-half of the mileage of the country is the property of these 42 companies.

The classification, according to earnings, shows 80 companies, each of which has a gross revenue in excess of $3,000,000. The roads of this class control 69.48 per cent. of the total mileage of the country, receive 82.09 per cent. of the amount paid by the public, and perform 83 76 per cent. of the total passenger service, and 82 66 per cent. of the total freight service of the country. Out of a total of 81,074,000,000 tons of freight carried one mile these roads carried 67,008,000,000.

The total number of locomotives on June 30, 1891, was 32,139, showing an increase of 1,939 during the year, and the total number of cars, the property of railroads, was 1,215,611, showing an increase of 45,944 during the year. The number of men employed in the United States during the year was 784,285, being an increase of 34,984. The number of men employed per 100 miles of line was 486. Each engineer during the year has on an average hauled 389,077 passengers one mile and [or f] 2,329,649 tons of freight one mile.

The total capitalization is $9,829,475,015, or $60,942 per mile of line. This shows an increase in outstanding capital of $602 per mile of line as compared with the previous year's report. An analysis of the changes in capital outstanding shows that income bonds have increased from $76,938,818 to $324,288,690. A considerable portion of this increase is probably due to a conversion of stocks into income bonds. Equipment trust obligations have increased from $49,478,215 to $54,735,157.

The gross earnings from operation during the year ending June 30, 1891, were $1,096,761,395, or $6,801 per mile of line. Operating expenses were $731,887,893, or $4,538 per mile of line, leaving a net income from operation of $364,873,502, or $2,263 per mile of line. The net income per mile of line was less than the net income of the previous year by $37. An analysis of gross income shows freight traffic, $730,793,699, or 67.17 per cent., and passenger traffic $281,178,599, or 25.64 per cent. The amount received from carrying mail was $24,870,015. and from express companies was $21,594,349.

The number of persons killed during the year was 7,029, and the number injured was 33,881. Of these totals the number of employés killed was 2,660 and the number injured was 26,140. The number of passengers killed was 293 and the number injured 2,972.

This report recommends legislation compelling railroads to adopt train brakes and automatic couplers, and also suggests that some steps be taken besides the adoption of the train brake to prevent casualties from falling from trains and engines. Reference is also made to the necessity of the block system and a more perfect application of the principle of personal responsibility in the case of accidents. An investigation in the matter of handling trains is recommended.

Celluloid Pens.

Celluloid pens are being made by Delpierre & Lamotte, of Paris, France. A blank, corresponding to the form of the pen, is first stamped out, and this blank is afterward put between heated dies, which give it its final shape. After cooling in a water bath the pen is finished by slitting it in the usual way.

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

Would it be possible or would it be useful to lay down a code to govern the conduct of engineers toward each other and toward their clients? Perhaps so. At any rate a recent event has led to a good deal of discussion, in print and in private, of a possible code of ethics or etiquette for the guidance of engineers. The discussion is useful. It will help to fix in the mind some unwritten but very useful rules of conduct, but that it will lead to the formal adoption of a code by any recognized body of engineers we doubt. In fact we doubt if human growth is in the direction of codes to govern particular bodies of men in their relations with individuals or with other bodies of men, be they guilds or trades or professions or states or nations. A great many years ago a Hebrew law-maker laid down certain simple rules of human conduct. The Founder of Christianity added a few other rules, and all that humanity has done since has been to try to get these primitive laws obeyed; and by far the most of the later human efforts in this way have been bungling and short lived. So, if one tries to make a code for engineers he can only start with one fundamental rule "be an honorable gentleman," and try in his own more or less clear-sighted way to amplify and expound that rule. When he has done he will probably tear up his code and conclude to let the race struggle along with the golden rule and the decalogue.

A bill to repeal the law against pooling railroad traffic or earnings has been introduced in Congress by Senator Cullom, and we print its provisions on another page. This proposed amendment to the Interstate Commerce law doubtless voices the sentiments not only of the great majority of railroad managers but of most competent students and observers. Prominent newspapers, even in the West, have admitted the reasonableness of modifying the fifth section, and the Interstate Commerce Commission has lately asked for the views of prominent railroad men and shippers on the subject. Probably the bill echoes the sentiments of the Commissioners, and the proposition to approve pools is certainly in line with the well known views of Ex-Chairman Cooley. The views of the *Railroad Gazette* on this subject are well known. The main reason why pooling should not be prohibited, is that it is the essential feature of the most successful plan ever tried for preventing discriminations, rate wars and instability of rates; all of which are as harmful to the public at large as to the railroads themselves. This is all that the advocates of pooling claim for it. The basis of its success lies in the fact that it removes the *motive* for secret reductions of rates. Theoretically it may be said that placing pools under the supervision of the Interstate Commerce Commission will imply that the public is willing to give that body more power than it now has in the regulation of rates; but practically, we do not believe that such an outcome is likely. It is fairer to regard the power given to the Commission by Senator Cullom's bill as analogous to the veto power of the Executive. The proposition to abolish punishment by imprisonment will meet general approval. The detection of illegal practices among railroad officers many times hinges on evidence which can only be got from other railroad officers. These men would often be quick to expose the acts of a competitor if they knew that the worst penalty would be a fine, to be paid by the company, when they would wholly refuse to divulge a word if they thought a personal acquaintance, or even a fellow-sinner, might come within the shadow of the jail. The clause about excusing witnesses from giving testimony which will criminate themselves is not very clear. As we understand the decisions in the Counselman and other cases, it will not be easy to devise a provision to get around this difficulty.

Judge Gresham on Section 12 of the Interstate Commerce Law.

In our last issue we published the decision of Judge Gresham on the application of the Interstate Commerce Commission for an order compelling certain officers of the Calumet & Blue Island and four other roads to produce books and papers and answer questions with reference to contracts suspected to exist between the Illinois Steel Co. and the five railroad companies. Judge Gresham, sitting in the United States Circuit Court, refused the application of the Commission on the ground that so much of section 12 of the Act as authorised the application was unconstitutional, and his Court had therefore no jurisdiction to entertain such application. The ground of the decision is somewhat novel. It is fundamentally a declaration that the dignity and prestige of the Court must be upheld. Judge Gresham describes the Commission as an administrative body, and as if this were not sufficiently depressing to the Commissioners, he further describes them as a non-judicial tribunal. He refuses to carry out the orders of "an administrative and non-judicial body" on the ground that his Court is not subsidiary to any such body or tribunal, and that it is not within the prerogative of Congress to subordinate the Courts of the United States to any such ancillary jurisdiction. We think we read between the lines a certain amount of indignation that the Legislative department should have assumed to attempt such an encroachment upon the judicial, and the effort seems to be resisted almost with indignation. Judge Gresham has probably had a decided opinion upon this subject for several years.

Perhaps we should call the decision unusual rather than novel, for more than a century ago the judges of the Circuit Court in New York State announced the principles that Judge Gresham now calls attention to, though its application to the provisions of the Interstate Commerce Act may still be a question upon which legal luminaries will differ. In the instance referred to the New York Circuit Judges declined to act as a Court in the office of Commissioners under a certain pension law but in view of its humane provisions accepted the appointment as individuals and not as members of the Court. They distinctly repudiated the proposition that they were acting as a Court in discharging the duties under the act.

We suppose, of course, that Judge Gresham's decision will be reviewed by the Supreme Court of the United States, and indeed it ought to be. For if it stands, the Commissioners will be in a good deal of doubt as to how much of the Interstate Commerce Act is left for them to execute. But we must not by any means assume that Judge Gresham deems void all of those provisions of the Interstate Commerce Act, which invoke the action of the United States Courts. He finds no fault with those provisions which authorize a resort in the first instance to the courts before the intervention of the Commission. He simply objects to his court playing second fiddle to the Commission. He is quite willing to entertain an action for damages accruing to any person by reason of the violation of the law by any common carrier. He apparently recognizes the constitutionality of the ninth section of the Act which gives a right of action for the recovery of such damages. Here, he claims in effect, the right is granted to an individual under statute and a direct remedy is provided according to the rules and principles of the Federal Courts; but this is quite a different thing from calling upon the Court to enforce the orders of the Commission, into the propriety of which orders it may have no jurisdiction to inquire. Another example of this independent procedure which may be taken in the Circuit Courts is found in the sixth section of the Act which directs a writ of mandamus to be issued by the Circuit Court where a common carrier neglects to publish its tariffs; and the same is true of the writ of injunction also given by that section. These being remedies directly given by the Act, the Court can ascertain in its own fashion the grounds for their issue and in a proper case decree remedies. On the other hand, if the Commission should make an order under the fifteenth and sixteenth sections of the Act requiring a common carrier to desist from a violation of the Act, and the carrier should refuse to observe the order of the Commission, the Circuit Court, according to Judge Gresham, would not be authorized to issue the writ of injunction or other process in aid of the order of the Commission, as provided in those sections.

This decision sweeps away not only a very important part of section 12, but also most of the force and practical effect of the fifteenth and sixteenth sections which authorize the Commission to issue orders requiring common carriers to cease from violating the Act and the Circuit Courts to enforce these orders. This will discourage those who wish to see the Commission made a strong judicial body; but it does not practically weaken it much, if any; for, it is to be remembered, those of its decisions which have really been effective have been those in which common-sense and equity were apparent to every one. Obedience was rendered not because of a technical decree, but in deference to public sentiment. This, as we have often said, is the most useful function of a railroad commission, and no deprivation of the sheriff's assistance can impair it.

But what we desire especially to call attention to is that Judge Wallace's recent decision upon the application of the Commission against the Texas & Pacific seems to be in direct conflict with the decision under view. Judge Wallace, in the case referred to, which was decided Oct 3, last, after a careful consideration of the merits of the case, though the question of jurisdiction was not discussed, found that the order of the Commission was a proper one under the circumstances, and granted an order of the Circuit Court enforcing compliance with the order of the Commission. Here he was doing precisely the thing that Judge Gresham decided the Circuit Court had not authority under the Constitution to do. We can see no substantial distinction in principle between the two cases and they seem to us to be irreconcilably in conflict. Who is right we shall not undertake to say. No doubt we shall shall know in the course of time; but in the meantime the Commissioners will have to haul in their sails, as far as legal enforcement is concerned. With the powerful battery of the Supreme Court against it, in the Counselman case, and the uncertainties engendered by the decisions of Judges Gresham and Wallace, public sentiment, if not unfriendly, will be unsettled, and it will probably be best to wait and see whether the Congressional committees can evolve any wisdom in the premises.

A Brake for High Speed Trains.

We have learned that some experiments were made last week at Altoona with a train equipped with an improved brake furnished by the Westinghouse Air Brake Co. for the purpose of obtaining a greater efficiency in stopping high speed trains. We have not learned the details of this brake apparatus nor of the trials made at Altoona, but such information as we have in regard to the result is certainly interesting.

As long ago as in the year 1878 it was discovered in the course of the brake experiments conducted by Capt. Douglas Galton and Geo. Westinghouse, Jr., in England, that, with the same pressure of the brake shoes upon the wheels, the coefficient of friction at high speeds was very considerably less than that found for low speeds. This led Mr. Westinghouse to add to the air brake apparatus then in use, a device which enabled him to secure a much greater pressure of the brake shoes upon the wheels at high speeds, and to reduce that pressure by degrees as the speed of the train became reduced in making the stops, so that practically a uniform retarding force of the brakes was preserved throughout the stops. Subsequent experiments with this device demonstrated most satisfactorily that much shorter stops could be effected by the utilization of this principle. The speed of trains at that period, however, was not sufficiently high to appear to warrant such a modification of the hanging of the brake beams as was necessary to secure the benefits of this device, and it did not come into general use.

During the past few years the general tendency to increase the speeds of passenger trains has again excited interest in this direction, and the Westinghouse Air Brake Co. has for a considerable time past been experimenting with various methods for increasing the

efficiency of the air brake apparatus for stopping trains running at high speeds.

One noteworthy step, by which considerable advantage is gained, has been the application of brakes to the leading truck of the locomotive. The advantage of the use of an efficient brake upon the leading truck was fully demonstrated on the Old Colony Railroad, which has since commenced the general application of a brake to the leading truck of its locomotives. A number of other roads have also taken up this matter with a full appreciation of its importance.

A long series of experiments, at the works at Wilmerding, has resulted in the practical trial last week, at Altoona, of an improvement in the quick acting brake apparatus, for the utilization of a high pressure of the brake shoes upon the wheels at high speeds, which is gradually and automatically reduced with the speed of the train. We learn that the nature of the improvement is such that it requires no change in the general arrangement of the foundation brake gear as heretofore used, but is simply an addition to the quick acting air brake.

The results of the recent trials at Altoona must be regarded as an important step toward the control of high speed trains by the air brake. In these trials the same train was first run over the course with the auxiliary device cut out, making several stops, and then again run over the same course, with the auxiliary device cut in, making stops in almost identically the same place and at practically the same speeds. The stops of the second run showed conclusively that, with the improved apparatus, stops can be made in about 75 per cent. of the distance required for the present quick acting, automatic brake, even where, as in this case, there was no brake upon the leading truck of the locomotive.

With a train of six passenger cars, equipped with the most modern brake apparatus, heretofore in use, in good condition, stops can be made on a level, from a speed of 60 miles an hour, in from 950 to 1,000 ft. The same train, equipped throughout with the improved brake apparatus and having the brake upon the leading truck of the locomotive, can be stopped, under the same condition, in from 600 to 700 ft. With the prevailing tendency toward high speed of passenger trains, the importance of these results cannot be over-estimated. The Pennsylvania Railroad is understood to be much interested in the development of this improvement and it is expected that it will soon be in regular service upon the fast trains of that road.

The Rear Collision at Greenville, N. J.

A rear collision of passenger trains at Greenville, on the Central of New Jersey, Dec. 8,* has attracted considerable attention because it was close to a large city, on a four track road, which runs passenger trains only one minute apart, and which is eqnipped with automatic block signals. The signals are the well known Westinghouse electro-pneumatic type. The block sections are about 2,000 ft. long and the home signal at the entrance of each section has with it, upon the same post, the caution signal for the next section in advance. The officers of the road state that the engineer in this case disregarded the caution signal at the entrance of what we will call section A, and approached the entrance of section B (where, as he had been warned by that caution signal, 2,000 ft. back, he should have expected to find a stop signal at such speed that he could not possibly stop, and he struck the other train just within section B. There was considerable fog at the time, so that if the engineer was ever disposed to strictly follow the rules it would seem that he would naturally have done so in this case; but he was behind time, the ferry-boat from New York having been detained by the fog, and he evidently took more risk than usual, rather than less.

The essential question, then, is simply one of discipline, and this has been discussed so often in the *Railroad Gazette* that we shall say but little now. A caution signal (in this case the semaphore arm with notched end, standing in the horizontal position) means that the engineman may pass it, but that he must be prepared to stop *at* the next "home" or "stop" signal (in this case the arm with square end a few rods behind the standing train). It does not mean that he must begin to apply the brakes after he reaches the home signal. He knows how far it is to that signal, and he must stop at the place where he knows it should be, even if the post has been demolished by lightning ten seconds before he reaches the place. As soon as he knows what the caution signal tells him, he must turn his mind to the matter of stopping: and he must not turn it again to the matter of going ahead until he sees the home signal, and sees that it has been changed to the go-ahead position. There is no rule, written or unwritten, permitting him to assume that the preceding train will have passed any distance beyond the home signal. That is the place for him to stop, whether the track is obstructed or unobstructed, unless he sees that the signal has been changed to the go-ahead position. He has no right to assume that the brakeman of the preceding train will come back with a flag if that train stops. The regulations of the block system provide him with a *complete* guide, and if he follows them he will be doing his full duty as far as guarding against such collisions as this at Greenville is concerned. These regulations are very simple; but in clear weather, on a straight line, a train running a mile behind another has no use for them whatever, for the engineman can see that the track for a long distance is clear, and every signal he comes to is "off;" that is, it indicates neither stop nor caution; and so he gets into the habit of going by his own notions instead of by the rules. The duty of the company, to kill out his guesswork ideas and inculcate the rules in their place, has not been thoroughly done.

We have often had occasion to criticise the daily press for ignorant and uncalled for comments on railroad accidents, but in this case we are glad to notice that a number of prominent papers have hit the nail exactly on the head. An incidental advantage of the adoption of a simpler system in place of the old flagging rules is that the ordinary observer can comprehend it, and therefore can make such intelligent criticisms as will serve to guide public opinion in right directions. The New York *Tribune*, whose editorial may be taken as a fair sample, says:

> The cause of the collision is exceedingly plain. In the first place two trains were sent out over the same track with an interval of only one minute between them, and then the engineer took the risk of entering a "block," although he knew that the train in front had not passed out of it. But for the fog he probably would have seen the first train in time to bring his own to a standstill. It is said that the running of such risks is not uncommon. Do the rules of the company permit this? The officials must know, at all events, that the best block system is worthless if the signals are not regarded implicitly.

But while a case like this affords a sharp illustration of the deficiencies of American railroads in general, as regards discipline of enginemen, the existence and use at this point of automatic signals gives prominence to a special feature, to which many managers are giving thought, and that is, the additional reliance upon the engineman that is necessary when the check afforded by the presence of a signalman is withdrawn. Those railroad managers who hold that enginemen, generally, cannot be satisfactorily held to a rigid standard without the inspection which is afforded by the presence of a man at every important signal will have their view greatly strengthened by a collision like this. The railroad manager who really believes that more than one-tenth of his enginemen are of the very highest and most reliable grade is hard to find, and of this one-tenth only a small percentage can be expected to own up to a mistake when there is no other witness to the negligent act but the fireman, and when the engineer knows that acknowledgement will cost him his situation. Even those who talk about educating the other nine-tenths, or even a portion of that part, up to a reasonable standard of vigilance and faithfulness, admit that it would require a larger number of inspectors or road foremen than any one now employs, and who ought to be of a higher grade than can be found at first sight.

The strong temptation to relax the rules which appeals to enginemen running under automatic signals is illustrated by an incident which a reliable correspondent reports as occurring on the very same road we are now considering, on the night before the Greenville collision. A coal train was following a freight train, on a straight line, where the caboose lights of the foremost train could be seen more than the length of a block in advance. The second engineman, though running at considerable speed, had his own train pretty well in hand, and was closely watching the speed of the foremost train. He reached signal A just before the caboose ahead of him passed signal B. He knew that signal A would, in all probability, very soon be cleared, and, seeing a clear track ahead of him, and reasoning, as most enginemen would, that there was no possible danger, he ran past the red light with apparently as little concern as he would pass a pink rose bush by the side of the track. It is unnecessary to say that railroad men have observed similar conduct with passenger trains, as well as with freight, and on other roads than the Central of New Jersey. Knowing, as we do, the strictness of discipline necessary to make enginemen respect signals where they are watched, we cannot deny the reasonableness of the contention that where they are not watched the discipline needs to be even more strict. To state it in another way, carelessness (or willful disobedience) being likely to be detected less frequently, the superintendent is bound both to punish detected cases more severely and to take more effectual measures to secure men of high conscientiousness.

The criticism that one-minute intervals are too short cannot be admitted in a discussion about safety, whatever we may say about convenience. Trains have been run through the two-mile Fourth Avenue tunnel in New York City at that or shorter intervals for ten years with great safety, and the one serious blot on this record may be said to be due to the injudicious changing of the low signals to the left hand side of the track, while the enginemen remained on the right hand side of the engines. If a space-interval system is not safe, entirely regardless of the time interval between trains, suburban railroads must increase the number of their tracks—usually impracticable—or decrease the accommodation of the public—not to be thought of.

* Train No. 11, westbound, due to leave Jersey City at 11:42 A. m., was stopped at Greenville because it was thought that the engine had struck a woman who was running to get aboard an eastbound train. The rear car of No. 11, when it stopped, was about 150 ft., beyond the block signal west of the station. The woman had not been struck but had fallen because of a fainting fit or something of the kind, and the train was ready to start again in a very short time; but just as the conductor gave the signal, train 309, which left Jersey City one minute behind No. 11, crashed into the rear car at pretty high speed, wrecking the rear end of that and forcing the car forward into the one next in front of it, wrecking the rear portion of that also. The rear car contained only three passengers, but the next one was well loaded and 15 persons altogether were hurt; one of them died the next day and two others were seriously injured. There was a dense fog at the time of the collision. This part of the road has electro-pneumatic automatic block signals, and there is no claim that the signals did not work properly.

Is a Check on Junction Car Reports Necessary?

When the car accountant has had his annual per diem disappointment, he returns regularly to the contemplation of the junction report, in which he feels a certain satisfaction, as the adoption of the junction report or junction card was the first, and remains the chief, success of the Car Accountants' Association. The consideration and reconsideration of this report has led to many propositions for changes, none of which have been universally adopted, although some have received quite general acquiescence.

For instance, a large number of railroads, besides showing the simple delivery of cars covered by the original junction report, are showing also whether the cars were loaded or empty when delivered and it seems not improbable that this custom may become universal. On the other hand the attempts to include in the junction report the destination and point of delivery of cars have been generally resisted. For the last year or so the Norfolk & Western has been leading a forlorn hope in a gallant attempt to secure the addition of the destination of each car reported on junction cards, but so far without any great success. It is to be feared that as long as the diversion of cars is as general as it is at present, the railroads diverting will have enough human nature to object to showing these diversions in black and white, and the destination will not appear on many junction reports. Indeed, it is possible that those who give the destination are giving more evidence as to their own diversions than they obtain from their neighbors. Some of the lines and private car companies which print their own junction report blanks have included columns for point of delivery and destination and we do not know but they have succeeded in obtaining it. They have very taking ways, as we know from the way that they have secured favorable mileage rates. With all the proposed changes, however, the junction report has maintained great stability in its original shape and even weathered the per diem storm of some years ago without material change.

That the junction card, when made regularly and carefully, is a useful report, is nowadays denied by no one. If it took less time to transmit the necessary intelligence from the various points of interchange to the various general offices and to distribute this intelligence to the owners of the cars, the junction report would leave little more to be desired. If, as is supposed, the railroad making the junction report holds a receipt for every car shown thereupon, it is about as positive an indication of change of responsibility for the cars concerned as could well be asked for.

There is, however, one important point which is not covered by either the practice or the theory of the junction report—that is, there is no way of detecting the loss in transmission of one of these reports. In case the road which sent the junction report handles very few cars of the road to which the report is sent the junction report is not made daily, but only when a delivery is made; and if the clerk in charge of the junction report fails to make a report for one date, or if one of these reports is lost in transmission, there is nothing to indicate that fact in either of the offices involved. In the same way, when the number of cars

returned is large and a number of junction reports are sent each day, there is nothing to show that the proper number of reports have been sent or have been received. It is especially hard to detect a loss of this kind where the transmitting railroad covers a great deal of territory and cannot receive the reports of all the interchanges of one day on the next day. In such cases the best practice demands the sending out of two or more sets of junction reports on different dates instead of holding all the reports of interchanges until all for one date are received. Then it is almost impossible for the road receiving the reports to detect the loss of one of them.

The only action which has been taken on this subject, so far as we know, has been an attempt to secure the use of United States postal cards for junction reports. Although the United States mail is not perfect, it is probably more perfect than the "Railroad Service." Indeed, there is some question whether it is legal for one railroad to transmit correspondence between two of its connections. Baggage car transmission of letters without postage is made legal only by rulings of the Post Office Department, which stretch some of the laws of Congress quite severely, and there are stories current to the effect that officials of the Post Office Department have destroyed such mail. Of course there can be no law against the delivery of mail matter from one railroad to its immediate connections, but even matter of this kind seems sometimes to be handled more rapidly by the United States mail. But even if loss in transmission were entirely guarded against, there is still the chance of mistake or omission in the offices involved in making and receiving reports, and it would seem that some positive check should be adopted to cover this.

Almost all the railroads have some check upon daily reports from their own agents and conductors. When there is nothing to report on a given date, it is common to insist upon the sending in of a blank report, dated and signed. Probably this would not be practicable with the junction report, as many railroads handle the cars of many other railroads so seldom as to make such a system burdensome; but it would be possible to number the junction reports very much as way-bills or manifests are numbered. This would be simple enough in cases where impression copies are kept of the junction reports, and where this is not done it would not be hard for the clerk in charge to keep a memorandum of the last number in each railroad's series. This would be a help in all cases and in many would doubtless be a passably sufficient check.

Another possible device would be to have each junction report show not only its own date but also the last date reported, although in the case where more than one date is reported in one day, referred to above, this arrangement would need modification. That some check against the loss of a junction report is worth having, no one will deny, and it is much to be desired that some of our enterprising friends in the car service department shall try the experiment and see whether it is worth the trouble involved.

Sizes and Fits of Bolts and Nuts.

In another column will be found a circular issued by the committee appointed by the Master Mechanics' Association to make a report on standard sizes of bolts and nuts. This is an important matter, as work is frequently delayed in repairs by bolts and nuts being under or over size. The circular contains some hard facts; the committee apologizes for going into details at some length, but no apology is necessary. Anything that will bring forcibly to the minds of builders the necessity for paying strict attention to the manufacture of the bolts and nuts they use is not out of place.

The resolution of the Association urging a rigid adherence to the United States standard is a vital one. Let anyone measure the different sizes of nuts used on locomotives, finished and rough, and he will find that two sizes of wrenches are necessary for each nominal size of nut on the engine. Only one locomotive builder, so far as we know, uses the same size of nuts for both finished and rough bolts. One of the largest builders in this country has a standard set of rough sizes and a standard set of finished sizes, the rough sizes being $\frac{1}{16}$ larger than the finished. The result is that they furnish a set of wrenches suitable for the rough nuts, which, when used on the finished nuts, round off the corners to the injury of the appearance of the engines. These builders raise a decided objection to all specifications sent them by railroad companies calling for finished and rough nuts to be of the the same size across the flats; yet to conform to such a specification is a simple matter, and they could well accommodate their customers by having all nuts of the same size, whether finished or rough. This would be but a small inconvenience in the manufacture, particularly for builders who use a large number of both finished and rough nuts.

Another matter in the manufacture of bolts which is well worth consideration by the committee and manufacturers generally, is the method of fitting the nuts to the bolts. On the face of the matter it would appear that taps might be made for the nuts, and dies might he made for the bolts, so accurately that the nuts would fit the bolts freely and be tight after use; but the fact is that under practical working conditions this cannot be done. Such builders as Brown & Sharpe, Pratt & Whitney, and other prominent makers of very accurate machinery, can, as a rule, so keep up their small tools as to produce bolts and nuts that will fit well, but even such careful manufacturers cannot always do it, as is seen from an examination of their product. How much more difficult is it, then, for the average builder, who employs an ordinary machinist, to make strictly accurate dies and taps. If a bolt is cut and a nut is tapped with ordinary tools in such a way as to fit freely without shaking when the nut is first put on the bolt, the nut will be very loose after it has been tightened up once, for the reason that the fit is imperfect, and as soon as the edges and bearing points are crushed down or abraded the nut becomes loose.

There is at least one way in which a proper fit can be had, and a clause to cover this point now appears in some modern specifications. It is a clause like this: "All nuts must fit bolts so tightly that it is necessary to use a 12-in. wrench in putting them on for the first time. Nuts must not fit so freely on bolts that they can be turned on with the fingers." The object of this is to insure a true fit of the nut on the bolt. The imperfections of the dies and taps are overcome by making the nut a little small or the bolt a little large and forcing them together. A close examination of the fit of a bolt and nut made in this way shows perfection of contact that is highly desirable.

The Committee on Wheel Centres and Tires has sent out a circular containing several inquiries about the dimensions of tires, and one particularly important inquiry relative to the need of a positive tire fastening, in addition to shrinkage, for large wheels. There is a decided tendency now toward larger wheels for express engines, and for obvious reasons it is necessary that these wheels be as light as is consistent with the requisite strength. To gain lightness, it is becoming somewhat common to make drivers of cast steel or wrought iron; and while a tire shrunk on a small, rigid, cast-iron centre may be sufficiently secure, it is possible, and in fact, probable, that a tire shrunk on a large wrought iron centre is not sufficiently secure without an additional fastening. A loose tire or a broken one is liable to cause a serious wreck when a train is running at high speed, and therefore some provision should be made to prevent a tire slipping in or out, or receiving any strain that will tend to fracture it. All methods of fastening tires by means of tap bolts are more or less questionable, as there is always a possibility, with this method of fastening, of inducing a fracture. A retaining ring is the most popular way of holding driving tires; but it may be that the circular issued by the committee will bring out other schemes more satisfactory. The report on this subject ought to be an interesting one if those who are using large drivers for high speed engines, with wrought iron or cast steel centres, will give to the committee their experiences at length. This is a matter about which theories are not particularly valuable when placed alongside of practical results.

Negotiations between railroad employés and their superiors about better wages or conditions seem to be very common just now, and the reports of such matters in the press dispatches are even more common than the negotiations. A committee of enginemen has been in New York City a week or two trying to get the New York Central management to deal in future with a committee representing the enginemen of all the roads included in the New York Central system, instead of sticking to the present plan of dealing in each case only with committees representing the men who actually have a grievance. The reporters, since the arrival of the committee, have daily worked up a half column each, and have printed a great variety of conjectures, but this seems to be the substance of all that has been done; or rather attempted, for the road refused to make any change, and the committee has evidently given up for the present. The ultimate object of the enginemen seems to be to get the pay of those running on the smaller roads in the system up to a level with that on the Central proper. The negotiations of the telegraph operators of the Cleveland, Cincinnati, Chicago & St. Louis for better wages have been mentioned in the press despatches nearly every day for two weeks, but very little definite information has been given out. Some of the men seem to have received a slight increase of pay, and the principal point of contention, at last accounts, was the recognition by the road of the operators' brotherhood, which is thus far denied. The committee representing the operators' brotherhood on the Chicago, Rock Island & Pacific ordered a strike throughout the lines of that road on Dec. 8, the day after General Manager St. John refused to talk with them because they produced no actual authority to represent any considerable number of men on the road; and for two or three days they succeeded in getting the associated press to tell the world, repeatedly, that great trouble was brewing. Five hundred out of 600 operators had struck and trains were being badly delayed. But the officers of the road stated that only 37 operators had left, that trains were running all right, and that there were two men ready to fill every vacancy. From Georgia we hear reports that all the operators of the Central of Georgia have struck, but the road seems to have got along without them. The enginemen of the Savannah, Florida & Western are reported to have secured the revocation of an order reducing their wages. The Lake Shore & Michigan Southern is reported to have granted its enginemen a considerable increase in pay.

A Chicago contemporary in commenting on the address of President Loring before the American Society of Mechanical Engineers, says:

"There is one statement made which we fear it would be a difficult matter to establish, and that is that a single cylinder engine will consume 50 per cent. more fuel than a triple expansion. This is given as the customary economy which may be expected in ordinary service. This difference can be obtained under certain conditions, but a single cylinder condensing engine will, if properly designed for its work, make a much better showing than this when compared with a triple expansion engine designed for the same work."

Now Commodore Loring is not only Past-President of the American Society of Mechanical Engineers, but he has been actively engaged in steam engineering work for over 35 years, has seen the modern quadruple expansion marine engine gradually developed from the old single expansion type, has served as Chief of the Bureau of Steam Engineering of the Navy, has been a member and chairman of numerous investigating and testing boards of naval engineers: and, in short, has been directly in charge of large steam engineering work for more years than our ambitious contemporary has been in existence. Having such a record it is not to be supposed that Mr. Loring will lay himself open to intelligent criticism by making rash statements on any subject, much less on that branch of engineering to which his life has been devoted. If no proof were forthcoming on either side we must confess greater confidence in Mr. Loring's statements on matters of steam engineering than in those of our contemporary, but we believe there are abundant published data to support Mr. Loring. However, on general grounds, the mere denial of the correctness of an affirmative statement is not enough, and when it comes to intimating that the President of the American Society of Mechanical Engineers does not know what he is talking about, it is certainly insufficient.

At a recent meeting of the directors of the Manhattan Elevated Co., New York, the following resolutions were passed:

That a committee of five and the President, ex-officio, be and is hereby appointed to take into consideration what further facilities and extensions are needed by this company to enable it to operate its lines to the best advantage, as to extent and economy, and thus meet the obligations of this company to the public in the fullest degree for a satisfactory rapid transit within the city limits.

That this committee have full power to confer and negotiate officially on behalf of this company with the Rapid Transit Commissioners, the officers of the city, and any other necessary authorities in relation thereto.

The President appointed as the Committee Mr. J. Pierpont Morgan, Chairman; Messrs. Russell Sage, Samuel Sloan, George Bliss and R. M. Gallaway. As we have often said, the quickest relief to the city of New York in facilities for rapid transit can be had through the Manhattan Elevated system. Whatever may be the fate of the Commissioners' plan, soon to be offered for sale, it cannot be completed for a long time, and when it is completed it will be only a partial relief. Meanwhile the capacity of the existing roads can be quickly and largely increased if the city will allow it. Why bite off your nose to spite your face?

NEW PUBLICATIONS.

Engineers' Surveying Instruments: Their Construction, Adjustment and Use. By Ira O. Baker, C. E., Professor of Civil Engineering, University of Illinois. New York: John Wiley & Sons, 1892.

This is a second and greatly enlarged edition of a very useful work. The title is self-explanatory. The various instruments and apparatus used in surveying are carefully and thoroughly described as to their construction and those of different form, but adapted to like purposes, are compared, and those forms capable of giving the best results in the work in hand are pointed out. The adjustments are simply explained, as is also the use to which the instruments are put, and much valuable information is given as to the limits of precision, by which a very good idea of the relative accuracy of the several

instruments devoted to the same purpose may be obtained.

The chapter on barometers is particularly good, presenting a very concise résumé of the subject, including the reduction of observations and a good discussion of the barometric formulæ.

The book will be of value to several classes of persons; to makers of instruments, who, by the consideration of many suggestions, may introduce improvements; to those interested in the purchase of instruments, and who wish to get those most convenient and best suited to their purposes; and to those who handle instruments and yet are more or less ignorant of the subjects of which the book treats. Unfortunately the latter class is large and it is in it that a knowledge of this volume will do the most good. There are many who are capable of doing pretty accurate work with instruments, but who do not appreciate the delicacy of their construction. To such as these the paragraphs on the care of instruments are especially addressed. The information this book contains is elsewhere only to be found scattered in the pages of large theoretical works, and in instrument-makers' catalogues, and the compilation of it in this compact form is sure to be popular.

An appendix contains articles on the elimination of local attraction in the use of the magnetic compass, and on the computation of area in traversing; a popular discussion on the theory of least squares, together with numerous problems in the use of the different instruments which will increase the value of the volume as a text book.

A New Electrical Magazine.—Mr. Fred. De Land, who has been the Western representative of the *Electrical World* for several years, announces in a circular that *World's Fair Electrical Engineering* will be published as an illustrated monthly magazine beginning in January. It is announced that in addition to World's Fair matter the new magazine will contain reviews of the leading articles appearing in the electrical papers during the month, a synoptical and classified index of electrical literature, a brief explanation of new specialties brought out each month and a review of the important patents granted each month. The size of the page will be about 6 × 9 in. The magazine will be published by the Electrical Engineering Publishing Co., with Mr. De Land as editor.

North American Railroads, form the subject of a book, just published by C. W. Kreidel, of Wiesbaden, Germany, the authors being Th. Büte. of Madgeburg, and A. von Borries, of Hannover, both of the motive power and rolling stock department of the State Railroads. Many American railroad men will remember the recent visit of these gentlemen and their keen and intelligent observation of American railroading. The book is profusely illustrated and gives the results of the inspection made by the authors in 1891. This report, for such it is said to be, in the main, is a continuous account of the observations and impressions of the authors. It has 74 illustrations in the text and 55 plates and is sold for 40 marks.

TECHNICAL.

Manufacturing and Business.

The Nevens Flanger Co., of Portland, Me., has been incorporated to manufacture the Nevens flanger for removing snow and ice from railroad tracks. This device is the invention of George Nevens, Road Master of the Maine Central, and was illustrated and described in the *Railroad Gazette*, of Feb. 3, 1888.

The King Bridge Co., of Cleveland, Ohio, is building for the Pittsburgh, Shenango & Lake Erie Road a hoisting and conveying plant for handling ore and coal at the new docks at Conneaut, Ohio.

George E. Wilson, President of the Clinton Bridge & Iron Works, of Clinton, Iowa, says that owing to an increase of business the company will largely increase its working force next year.

The factory of the United States Mineral Wool Co., at Stanhope, N. J., was partially destroyed by fire on Dec. 1, and the company lost all stock on hand. Rebuilding was commenced at once and the factory will be in running order by Jan. 1.

The Litchfield Car & Foundry Co., of Litchfield, Ill., is making considerable additions to its plant.

Work on the new buildings for the Bushnell Manufacturing Co., which will remove from Poughkeepsie, N. Y., will soon be commenced at Odenweldertown near Easton, Pa. The National Switch & Signal Co. shops will also be located at this town. The Bushnell Co. manufactures car seats and springs. The new officers are Edwin L. Bushnell, President; Edwin M. Bushnell, Secretary and Treasurer; Edwin L. and Edwin M. Bushnell and Thomas J. Smith, Board of Directors.

Iron and Steel.

The rail department of the Pottsville Iron & Steel Co's rolling mills has suspended operations owing to a scarcity of orders. The company's West Hamburg mills have also suspended.

The rail mill of the Bethlehem Iron Works, which closed Dec, 8, was restarted on Dec. 12, and it is announced that the orders received will keep the mill running for two weeks. "Confidence in the incoming administration" seems to have been restored.

The South Fifteenth street mills of the Oliver Iron & Steel Co., at Pittsburgh, have closed down, and thrown 1,000 men out of employment. The plant embraces a beam mill, universal mill, plate mill, and 8, 10 and 20 inch mills.

The upper mill of the Lackawanna Iron & Steel Co. shut down Dec. 10, on account of lack of orders. This move throws 500 men out of employment.

New Stations and Shops.

The East Tennessee, Virginia & Georgia, has about completed new repair shops at Knoxville, Tenn., and is equipping the shops with machinery.

Ground has been broken at Charleston, W. Va., for the foundations for the stone passenger and freight stations and office buildings for the Charleston, Clendennin & Sutton Railroad.

Plans are under construction by the Pennsylvania for the enlargement of the terminal facilities at Camden, N. J. A new station will be built on made ground. The present ferry slips will be extended further into the river and a new slip built, making four in all. The present arrangement of tracks will be changed and 12 tracks will lead into the new station. It is said that the present train shed of the Broad street station, Philadelphia, will be removed to Camden and erected there as soon as the new train shed for the Broad street station is completed.

The Berlin Iron Bridge Co., of East Berlin, Ct., has the contract for three new iron buildings and iron roofs for the East River Gas Co., to be built at Ravenswood, L. I.

Trial of the Cruiser "Bancroft."

A preliminary trip of the cruiser "Bancroft," for the Annapolis Academy, was made Dec. 12. The vessel left her wharf at Elizabethport, N. J., and steamed through the Kills, New York Bay and the Narrows, past Scotland Light. There she was turned and headed for Elizabethport. With 202 revolutions the cruiser developed a speed of 12.6 knots. She is capable of making 240 revolutions, which is expected to develop a speed of 14 knots. She will be put on the drydock and have her bottom scraped and repainted before the regular trial trip is made

The New York & New Jersey Bridge.

The promoters of the New York & New Jersey Bridge enterprise have begun work in Washington toward getting a congressional charter for their bridge across the Hudson. This will be opposed by various interests in New York of considerable strength. Whether or not the prospect of getting the bill through is better this year than last, we cannot judge.

Electric Transmission.

The total loss of power in the long-distance electric transmission plant between Lauffen and Frankfort, Germany, amounts, according to official report, to but 25 per cent., the measurements being made at the turbine shaft and at the binding posts of the converter. This loss is apportioned as follows: dynamo, 8 per cent.; line resistance, 11 per cent.; and each converter about 3 per cent., thus giving a useful effect of about 75 per cent.

Electric Railroads in Chicago.

The power-house of the Chicago City Railway Co. from which it is intended to operate the electric lines, in the southern part of the city, to which reference has previously been made, is placed on Wabash avenue, between Fifty-second and Fifty-third streets. The boiler room is 56 by 128 ft., and is to contain 14 tubular boilers, each 72 in. in diameter by 20 ft. long. Mechanical stokers of the Murphy pattern will be used. There are to be 10 Wheelock engines, having cylinders 24 by 48 in. and rated at 500 H. P. each, at 110 revolutions per minute. The engines are to be coupled in pairs, and each pair will drive two No. 6 Westinghouse multipolar generators by means of a novel arrangement of rope transmission.

The track so far constructed is laid with 82 lb. Johnson girder rails, which are placed on steel chairs and 6 by 8 in. oak ties placed 2 ft. 6 in. apart. A supplementary wire is used for the return, the rails are bonded, and the circuit further improved by sinking old car wheels at intervals of a quarter of a mile. The car equipment will consist of Brill cars with Westinghouse single reduction motors.

An Important Step in Air Brakes.

Some trials of an improved form of air brake were made at Altoona, Pa., on Dec. 7. The brake is the result of experiments, extending over the past eighteen months, by the Westinghouse Air Brake Co., to secure in a more practical form of apparatus, the results obtained by the pressure regulating device of Mr. Westinghouse, used in the well known Galton-Westinghouse brake experiments.

The train consisted of an eight wheel locomotive, equipped with the cam driver brake and six coaches having the standard double-shoe brake of the Pennsylvania. In addition to these was the Pennsylvania dynamometer car, upon which the brakes were not used. The tests were made under the direction of Mr. Vogt, Mechanical Engineer, P. R. R., in two series. The first series took place during a run upon the Altoona Branch and consisted of several stops, made at different speeds, with the standard quick action brake. The train then returned and a second series of stops was made with the improved brake, in a second run over the same course, upon the same grades and at practically the same speeds, which were in both runs, determined very accurately in the dynamometer car.

The lengths of stops made in the second series were, quite uniformly, about 75 per cent. of those of the first series. Owing to the fact that the dynamometer car which weighs 37,000 lbs. was unbraked, the length of all stops was greater than would otherwise have been the case; but, as the important feature is the relative length of stops, with and without the improvement, the results were considered very satisfactory.

Inspection and Classification of Lake Steamers.

A meeting of lake underwriters, vessel owners and ship builders was recently held in Detroit for the purpose of perfecting an agreement on the inspection and classification of steel steamers, but no definite conclusion was reached. A committee of three was appointed to develop some plan which would be acceptable to all the interests concerned. All of the steel ship building yards around the lakes were represented at the conference excepting the Globe Iron Works of Cleveland. The vessel owners sent but a small representation. The underwriters' committee will meet at an early date, and it is believed that some plan can be formulated which will be generally acceptable. The question of the Lake Carriers' Association taking part in the new scheme of vessel inspection will come before the annual meeting of that association in January.—*Exchange.*

Coal Consumption on an Electric Street Railroad.

In an article in the *Electrical Engineer*, by Mr. A. C. Shaw, describing the power plant of the Biddeford & Saco railroad, the following results of a two days' test are given:

Total car miles per day	701
Mean electrical horse power output	50
Maximum electrical horse power output (reached only once during two days' run)	171
Pounds of water evaporated per pound of coal	8.92
Pounds of coal per car mile	7.56
Cost of coal per car mile, cents	1.51

The total rated capacity of the various parts of the plant is, boilers, 200 H. P. at 100 lbs. pressure; engines, 260 H. P., at the same pressure, and generators, 240 electrical H. P. The actual mean output during the test was but 20 per cent. of the capacity of the plant. The maximum load was 171 H. P., which is about 71 per cent. of the capacity of the plant. On Sundays, when the traffic is increased to about 1,000 car miles a day; the fuel cost was reduced to a fraction less than one cent per car mile. This plant consists of two Manning vertica boilers, two Westinghouse compound non-condensing engines, and two Thomson-Houston generators.

The New Corbin Tunnel.

Mr. Austin Corbin's new project for a tuunel from Brooklyn to Jersey City seems to be a good deal to the fore. A conference was held the other day in Philadelphia between certain officers of the Pennsylvania and the Long Island railroads, and while no corporate action has been taken by either company, the project seems to have been favorably considered by both. It is to run a tunnel from near the Flatbush avenue station of the Long Island in Brooklyn to the East River, passing under streets so far as possible, and to strike the New York shore under Maiden Lane. The line will then run under Maiden Lane and Cortlandt street to the North River, and thence to Jersey City near the Pennsylania station. A New York and a New Jersey corporation have been formed and it is supposed that they will consolidate as soon as practicable and that work will begin before long. The plan includes several stations in New York and in Brooklyn with passenger elevators to the surface. The tunnel is intended to fulfill two objects, one to handle the passengers into and out of New York; and one to give a convenient route from Long Island to the Pennsylvania railroad. Mr. Corbin says that a pilot tunnel will be driven across the North River before the actual tunnels are begun. The tunnel will be a little less than four miles long and will have a section 29 ft. high by 21 ft. wide, or its equivalent in the form of tubes.

Friction Losses in Stationary Engines.

As an example of the misuse of engines of the triple expansion type, the following results of a test made by Mr. J.H. Vail are interesting. The test of a triple expansion, non-condensing engine gave the following results. The loss by engine friction as shown by friction cards was 15.9 H. P. Under a load of 41.1 electrical horse power the indicated power was high pressure cylinder 34.9, intermediate cylinder 22.0, and low pressure cylinder 12.7, giving a total indicated horse power of 69.6, and a commercial efficiency of 59 per cent. The low pressure piston and running gear were then disconnected and the engine tested as a cross-compound non-condensing engine. The loss by engine friction in this case as shown by indicator cards was 9.6 H. P. Indicator cards taken with a load of 37.17 electrical horse power showed 32.8 H. P. in the high pressure cylinder and 20.8 H. P. in the intermediate cylinder. The total indicated horse power was thus 53.6, and the commercial efficiency 69.3 per cent.

The Chignecto Ship Railroad.

It is announced that a contract has been made with a thoroughly responsible firm to carry the building of the Chignecto Ship Railroad to completion for a fixed sum. This being the case, the shareholders are under pledge to raise the necessary money, and it is believed that work will be resumed in the Spring and rapidly pushed forward to completion. The Dominion Government will pay an annual subsidy for 20 years of sufficient amount to help out very materially in paying fixed charges. This subsidy, however, is conditioned on the performance of

actual work. It cannot be collected until an actual demonstration is made of the fitness of the railroad and machinery to lift a ship out of the water and carry it across the isthmus and return it to the water with reasonable speed and without injury. Certainly it is to be hoped, in the interests of the engineering art, that this work may be speedily completed.

THE SCRAP HEAP.

Notes.

The block signal system on the New York Central has been extended as far north as Hudson, and the entire Hudson River division to Albany will be put in operation very soon.

Two masked men entered a train of the Chesapeake & Ohio near Huntington, W. Va., on Monday night, and attempted to rob the passengers. Two passengers attacked the men, and one, who was on his bridal trip, was shot and mortally wounded. Another passenger, Peter Drake, of Cincinnati, was also shot, but the robbers were driven off. One man was subsequently arrested on suspicion.

The Secretary of the North Atlantic Steamship Association announces that, in view of the American regulations in regard to immigrants, the association has decided to carry on its vessels only saloon and second class passengers from Jan. 1, 1893. It was also decided to reduce materially the number of sailings during 1893, and to raise the saloon and second-cabin rates in order to make up the loss that will be incurred through abandoning the steerage traffic. All special excursion rates for the Chicago Columbian Exhibition have been withdrawn by the association. The Trunk line railroads will probably now appear to the newspapers as a very mild sort of sinners.

World's Fair Notes.

The work of elevating the Illinois Central tracks is progressing rapidly, and in the vicinity of Jackson Park, but two tracks remain at the old level. At Twelfth street, work on the new depot is so far advanced that the general shape of the building and the size and character of the trainshed can be clearly seen. Apparently all of the iron work for the latter is on the ground and a large proportion of it is in place.

Colonel Gillespie Corps of Engineers, U. S. A. is preparing for exhibition in the Government Building of the World's Fair a beautiful collection of models showing the harbor and river improvements during recent years. The models, which are being made under his supervision, show the improvements of 20 miles of the North River, improvements of the Harlem River, Hallett's Point before and after the work of blasting, the work around Sandy Hook, etc. The Hallett's Point model has been so arranged that the top, representing the top of the rock, will open and show inside the tunnels and galleries which were excavated and sunk in the rock preparatory to blowing it up.

A trip over the Illinois Central to the World's Fair Grounds at present shows that the beginning of winter weather has produced very little effect on the progress of work in Jackson Park and along the line of the railroad. In Machinery Hall work is progressing rapidly in the erection of water tube boilers of various makes, and on the foundations for engines and pumping machinery. Of the three overhead traveling cranes which will be erected in this building the Yale & Towne crane is in position, and the tracks for the Morgan and Sellers cranes are in readiness. In the Transportation Annex the large electric transfer table built by the Industrial Works is erected, and the wires for conveying current to it are being put in place.

The Armour Institute, Chicago.

Mr. P. D. Armour has built and will give to the city of Chicago a beautiful building, for the purposes of an industrial institute, which he will endow with $1,400,000 for its support. The building is five stories high and contains chemical and physical laboratories, woodworking rooms, rooms for teaching drawing in various branches, and for domestic arts, such as cooking, dressmaking and millinery. The building will also contain a gymnasium, a technical museum and a library.

Opening the Great Northern Extension.

The citizens and business men of St. Paul are making preparations for a magnificent demonstration in honor of James J. Hill, President of the Great Northern Railway, to celebrate the completion of the extension of that road to the Pacific coast. It will include a street parade, a public reception and banquet. The celebration will extend over two days, and it is the intention of those who are arranging for it to eclipse the demonstration at the time the Northern Pacific was completed in 1883. The Board of Trade of Seattle is also arranging for a celebration at Seattle.

Shipments from Duluth.

The business at the port of Duluth during 1892 shows a considerable increase over the season of 1891. The receipts of coal were 1,339,224 tons, and those of merchandise were nearly 100 per cent. larger than in 1891. There were 2,178,264 barrels of flour, 10,757,153 bushels of wheat, 6,600,050 ft. of lumber and 4,500 tons of iron ore shipped. Next season the shipments of ore will be very large as the stocks of the Duluth & Winnipeg on Allouez Bay have been completed, and the railroads reaching the mines on the Mesaba range will be in shape to begin hauling ore as soon as the navigation opens.

A Postal Car on a Street Railroad.

Postmaster Harlow, of St. Louis, has just succeeded in establishing the mail car on the St. Louis and Suburban electric road described in the *Railroad Gazette* some weeks ago. The car resembles an ordinary mail car in appearance, but is equipped with motors and trolley connections. The car leaves the post office at 6.25 a. m. for its first trip, and arrives at Cabanne a distance of five miles, at 7 o'clock. It is met at ten or eleven waystations by the carriers assigned to routes in the adjacent districts and exchanges of mail are made. Returning, the car leaves Cabanne at 9 o'clock, and mail is delivered at the post office at 9:33; and at 9:50 the car starts on another trip. At present three trips a day are made. By this means mail is delivered much more promptly in the sections of the city which can be conveniently reached from the St. Louis and Suburban road.

Erie Canal Affairs.

The water was finally drawn off on the 8th inst. having been let in on the 7th to get the rest of the grain fleet through.

The commerce out of Buffalo by canal this season shows 5,460 boats cleared; about the same number as in each of the two preceeding years. These boats carried 27,865 barrels of flour and 31,688,815 bushels of grain, 3,000,000 bushels less than in 1891 and 7,000,000 less than in 1890 The average freight rate on wheat for the season was 3.4 cents, which is the lowest average in the history of the canal, except for 1888 when the same average rate was received.

The report of State Engineer Schenk will say, in part, that the aqueducts reported by State Engineer Bogart as unsafe last year are still in a dangerous condition and will require an expenditure of $75,000 for the safety of next year's traffic. Mr. Schenk advises the expenditure of $100,000 in repairing culverts, waste wiers, etc., and "bottoming out." About $1,000,000 has been expended in enlarging the prism of the Champlain canal to a bottom width of 44 ft. and a depth of 6 ft., and an additional expenditure of $1,000,000 will complete the improvement. The Shinnecock canal and draw bridge, which has been under construction for about 10 years, has been completed at a total expense of about $100,000. Much attention will be given in the report to the possibility of utilizing electricity as a motive power on the State canals.

Corporation with the general government in the State geodetic survey is urged with the truthful statement that the map of the Empire State is in general so full of errors as to be absolutely unreliable. Governor Hill's plan of building two intersecting roads through each county by the State, as a nucleus around which a system of improved roads shall be built by the counties will be strongly advocated.

The Welland Canal was closed Dec. 12.

The Pennsylvania Elevated Line at Elizabeth.

The unfavorable weather of the past week has delayed the work on the Pennsylvania elevation at Elizabeth, N. J., but in spite of this considerable progress has been made. At Pearl street crossing three courses of neat work on the abutments are laid and the column foundations in the centre of the street are down. At Rahway avenue the excavations are made, and the foundations are in up to the spring of the skew arch, on the south side. At West Grand street the excavations are made and part of the foundations are in. At the Broad street crossing the foundations are all finished but the topping off. The trestle is all up for the two tracks being elevated and most of the ties are in place. The tracklaying has been delayed, but will be commenced shortly.

Help the Infant Industries.

Mr. Vest has introduced into the U. S. Senate a bill to encourage the construction of electric railroads, and especially to aid in the construction of the proposed electric railroad between Chicago and St. Louis. And yet, we are told, in the very costly advertisement in which the stock of the road is offered to an eager public that, each one of eight separate items of income will more than pay operating expenses, and that "its volume of passenger travel, express and mail business that will necessarily be diverted to it, figured on a most conservative basis, and considering through business alone and not including the power and light distributing business, will enable the company operating it to pay dividends on its capital stock of from 12 to 15 per cent. Its electric light and power distributing business will certainly add from eight to ten per cent. to this amount." Most of us would try to wrastle along, with such a "snap" as this, without the help of the taxpayers of the nation.

The Northern Pacific Special Committee.

The special committee appointed by the stockholders of the Northern Pacific to examine the company's property, have completed their tour of inspection. The committee started from Chicago the latter part of November, and their trip included all the branches as well as the main line of the road. They returned to St. Paul on Friday last, and went from there to Duluth, Superior and Ashland. General Manager Mellen and Chief Engineer Kendrick accompanied them on their trip to the Pacific Coast. The report will be submitted soon after the first of the year.

A Deep Waterways Convention.

Secretary S. A. Thompson, of the Duluth Chamber of Commerce, has issued a circular letter to commercial organizations and others, asking if the time has not fully come when every consideration of national prosperity and national honor demands the construction, by the national government, of a ship canal through American territory from the great lakes to the Hudson River, and thus to the sea. He sets forth that the existing facilities are entirely inadequate for the prompt and economical transportation of the enormous and constantly increasing volume of traffic produced by the unparalleled development of our country. Mr. Thompson suggests both an organization to further the building of this ship canal and a convention to be held at Washington shortly after Christmas holidays. There seems to be an impression along the lakes that such a convention at the time suggested, would be premature. A heavy percentage of the vessels now employed on the lakes are owned by railroad companies, and it is supposed that all of this influence would be thrown against any radical enlargement of the Erie Canal. The next Congress, if the grangers hold the balance of power in the Senate, will perhaps be more inclined to hear deep water arguments.

The Kryptophone.

The "kryptophone," invented by R. Henry in 1883, has, according to the *Lumière Electrique*, recently been perfected to such an extent that it now promises successful practical results. In the kryptophone a very sensitive receiving diaphragm is so disposed that it will respond to and transmit air vibrations produced by any noise to a distant telephone, an alarm bell being provided at the receiving station to attract the attention of the attendant. The sensitiveness of the apparatus is said to be such that with the receiving diaphragm immersed in a body of water the pulsations of a steamboat, from 2 to 3 miles distant, are readily discernible. Buried in a roadway, the diaphragm also is said to give warning of the approach of vehicles and foot passengers at a considerable distance. The kryptophone, accordingly, is said to be looked upon as a very likely instrument for burglar alarm and other similar purposes. Trials made with it in the harbors of Brest and Cherbourg, under the direction of Admiral Gervais, are said to have been very satisfactory.

Aluminum Horse Shoes.

Aluminum horse shoes, according to *L'Avenir Militaire*, have recently been subjects of Russian experiment, the horse shoes being tested in a comparative way in a regiment of dragoons. One hoof of each of a certain number of horses in the regiment was shod with an aluminum shoe, while the other hoofs were shod in the ordinary way with iron shoes. The horses performed their regular service, and after a period of six weeks the shoes were removed and examined. It was then found that the aluminum shoes had not only become worn less than the iron shoes, but had actually given much better service, even though the horses had traveled over hard and stony ground. Aside from this advantage the aluminum shoes are said to have only about one-third the weight of the iron shoes. Of course they cost more, but this drawback is considered to be more than counter balanced by their other advantages.

A High Authority on Shipbuilding.

One of our railroad contemporaries appears to have entered the field of naval architecture, and if its summary of the question of Iron vs. Wooden Ships may be taken as a sample of what is to follow, it will doubtless soon be a recognized authority. We quote a few sentences: "What means has the sailor, owner or underwriter to know what strain an iron ship will stand when she is completed at the shipyard? The only time it is tested is in a heavy gale at sea, and that has proved fatal only too often, as records will show. . . . Who can tell whether there is one, a thousand or more rivets crystallized? . . . Some of the iron and steel used nowadays in shipbuilding is much of a cast iron nature. The masts and yards are subject to the same laws as the hull. Wooden ships have been dismasted at sea and rigged up again with what few spars and other material that is usually carried aboard of any ship. In such case an iron ship is helpless and has to make port. A carpenter's broadaxe can do more at sea under difficulties than a cold chisel and hammer." The logic of all this is unanswerable, and builders of cast iron ships will doubtless soon close their yards.

Some Foreign Railroad Statistics.

The latest number of the *Archiv für Eisenbahnwesen* (Berlin) gives some statistics of German railroads, particularly of the Prussian Government lines, comparing them with corresponding data of French and English roads. The extent of the German lines was increased in the last 10 years by 4,736 miles, or 22.3 per cent.; the growth of the French lines during the same period was 5,772 miles, or about 34 per cent., and that of the English lines, 1,896 miles, or 10½ per cent. While thus, for the 10-year period, the growth of the French lines exceeded that of the German, it is pointed out that during the three years, from 1888 to 1891, the progress in the two countries has been about equal, amounting to 4.5 per cent. in Germany, and to 4.7 per cent. in France. During these three years the increase in English roads was only 1.3 per cent. Earnings, for the year 1890-91, amounted in Germany to 4.86 per cent. of the invested capital; in England, to 4.1 per cent., and in France, to 3.75 per cent. On the Prussian State lines alone the earnings represented 5.39 per cent.

LOCOMOTIVE BUILDING.

The Chicago, St. Paul, Minneapolis & Omaha will soon place an order for five 19 × 24 ten-wheel freight engines.

W. E. Griggs, receiver of the Chautauqua Lake road, has placed with the Brooks Locomotive Works an order for one passenger and one freight locomotive, to be delivered in February.

The Schenectady Locomotive Works has received the contract for building three freight engines for the Maine Central, and for eight locomotives for the Chicago & Eastern Illinois road.

CAR BUILDING.

The Norfolk & Western has issued specifications for 3,000 cars.

The Great Northern has received four dining cars from the Barney & Smith Manufacturing Co.

The Cleveland, Akron & Columbus has placed orders for three parlor cars and five day cars, to be delivered by March 1.

The Duluth & Winnipeg has issued specifications for 650 cars, 500 ore, 100 box, and 50 platform. The contract will be let as soon as the bids are received.

The Ensign Manufacturing Co., of Huntington, W. Va., has the following orders on hand: for the Cleveland, Akron & Columbus, 325 30-ton plain gondola cars, and for the Chesapeake & Ohio, 750 30-ton hopper bottom gondola coal cars, and 250 30-ton box cars, both classes of cars to have Janney couplers and Westinghouse air brakes.

BRIDGE BUILDING.

Allegheny County, Pa.—Representative Dalzell, of Pennsylvania, has introduced in the House of Representatives a bill authorizing the Union Railroad Co. to construct a bridge across the Monongahela River between a point in Mifflin Township and a point opposite, in Welkins Township, in Allegheny County, Pa.

Baltimore, Md.—The city council last week passed an ordinance providing for the building of an iron bridge on Baltimore street at Jones Falls and appropriating $37,500 for the work. Bids were recently asked for erecting this bridge and a number were submitted. Owing to an uncertainty as to whether the terms of an old law limiting bids for work to be done for the city to Baltimore firms applied in this case, it was decided to ask the city council to pass a new ordinance. New bids will now be asked for, and will not be limited to Baltimore firms.

Bethlehem, Pa.—The workmen employed by the Bethlehem Iron Co., at Bethlehem, have started a movement for the erection of a free bridge across the Lehigh River. They have appointed a committee to ascertain the cost of a bridge, to recommend a site, to start subscriptions and recommend the best plan for its erection. The committee consists of Geo. Jenkins, Superintendent of the Bessemer Mill, and others.

Bristol County, Pa.—A petition has been presented to the Legislature from H. A. Brown, W. H. Gifford, Joseph H. Markland, Perry P. Brightman, Henry M. Baker and others, that the Bristol County Commissioners be authorized and directed to construct a bridge and highway across the tide waters of Westport River

to connect Westport Point and Horse Neck in Westport, at a cost of $14,000.

Cambridge, Md.—Engineer Latrobe, of Baltimore, acting for the County Commissioners of Dorchester County, has recommended that the contract for the draw and superstructure of the bridge to be erected over Cambridge Creek be given to the Wrought Iron Bridge Co., of Canton, O., at $5,000, and that the sub-structure be given to the Delaware Construction Co., of Wilmington, at $4,974.

Hudson County, N. J.—Bridge Superintendent Gannon has reported that the bridges over the Morris Canal, at Pacific avenue and Newark & New York Railroad at Arlington avenue, are in a dangerous condition.

Little Rock, Ark.—The Pulaski County Court met Dec. 6 at Little Rock and decided to build a free bridge across the Arkansas River at Little Rock. The bridge contract is to be let by two Commissioners to be appointed by the County Judge, and is to be paid for by a fixed sum to be paid annually, not to exceed $25,000 a year, for 12 years, and the tolls of the bridge for a fixed term of years. The bridge will probably cost $250,000.

Llano, Texas.—The new steel wagon bridge across the Llano River at this town, which was built by the Wisconsin Bridge Co. was opened Dec. 1. The bridge is 803 ft. long with four spans of 224 ft. each and cost about $40,000. It has a 22-ft. roadway and 5-ft. sidewalks on each side.

Tweed, Ont.—The following tenders were received by the roads and bridge committee for the erection of an iron bridge at Tweed village: The Central Bridge & Engineering Co., of Peterborough, for the bridge, $2,067, and with sidewalk, $2,325; Brown Mfg. Co., Belleville, for bridge, $3,400, inclusive of sidewalk, $3,700; King's Bridge Co., Cleveland, for bridge, $3,000, with sidewalk, $3,300; R. Weddell, of Trenton, for bridge, $3,000, and sidewalk, $3,400; the Dominion Bridge Co., of Montreal, for bridge, $2,550, inclusive of sidewalk, $2,945. The committee recommended the acceptance of the Peterborough Bridge Company's tender.

Morgantown, W. Va.—On Tuesday last, the Morgantown Building & Improvement Co. let to I. N. Weaver the contract for the erection of a 175-ft. span trestle highway bridge over Falling Run at Beechurst avenue. Work is to begin at once and the bridge completed before April 1.

Mt. Savage, Md.—The superstucture for the new highway bridge over Jenning's Creek at Mt. Savage, Md., arrived last Tuesday and will be erected at once. The abutments and piers have been ready since Oct. 1. The Youngstown Bridge Co. has the contract for superstructure and erection.

New Orleans, La.—The Senate bill to authorize the construction of a bridge across the Mississippi River above New Orleans for the use of the Southern Pacific Railroad was reported from the Senate Committee on Commerce, and passed.

Northport, Wash.—The contract will be let on Dec. 24 for the bridge across the Pend d' Oreille River on the extension of the Spokane Falls & Northern Railroad. The bridge will consist of two 150 ft. Howe spans and one 250 ft. combination span. E. J. Roberts, Spokane, Wash., is Chief Engineer.

St. Louis.—The St. Louis & Madison Bridge Transfer Co. has been organized to build a wagon way and foot walks on the St. Louis Merchants' Terminal bridge. The people particularly interested in this addition to the Merchants' Terminal bridge are the residents of North St. Louis, and the subject has been agitated among them for some time. The officers of the bridge company have informed the local committee that they would be willing to have a wagon way constructed and the company named above has been organized to secure funds for the work which it is estimated will cost about $350,000.

Tacoma, Wash.—The contract for the sub-structure of the Northern Pacific bridge, across the channel at Fifteenth street, has been let to A. McMullen & Co., of Minneapolis, Minn., and work will be begun at once. The contract for the super-structure has not yet been awarded. It will be of iron, and about 16 ft. in width, intended for a single track.

West Elizabeth, Pa.—A bill was introduced in Congress last week providing for the erection of a bridge over the Monongahela River at West Elizabeth.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Chicago Junction Railways & Union Stock Yards Co., semi-annual, 3 per cent., on the preferred stock, and 4 per cent., on the common stock, payable Jan. 5.

Manhattan, quarterly, 1¼ per cent., payable Jan. 3.

New York & Harlem, semi annual, 4 per cent., payable Jan. 3.

Northern Central, semi-annual, 5 per cent., payable Jan. 16.

Providence & Worcester, quarterly, 2½ per cent., payable Dec. 31.

Rensselaer & Saratoga, semi-annual, 4 per cent., payable Jan. 3.

Tennessee Coal & Iron, semi-annual, 4 per cent., on the preferred stock, payable Jan. 15.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Brooklyn Elevated, annual. Brooklyn, N. Y., Jan. 4.

Cleveland & Pittsburgh, annual, Cleveland, O., Jan. 4.

Housatonic, annual, Bridgeport, Conn., Dec. 20.

Kingston & Pembroke, special. Kingston, Ont., Dec. 31, to authorize the issue of first preference five per cent. bonds.

Rome, Watertown & Ogdensburg, annual, New York City, Dec. 28.

Terre Haute & Peoria, annual, Decatur, Ill., Jan. 18.

Toledo & Ohio Central, special, Toledo, O., Dec. 31.

Western New York & Pennsylvania, annual, Philadelphia, Pa., Jan. 9.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *New England Railroad Club* holds regular meetings, at the United States Hotel, Beach street, Boston, Mass., on the second Wednesday of each alternate month commencing January.

The *Western Railway Club* holds regular meetings on the third Tuesday in each month, except June, July and August, at the rooms of the Central Traffic Association in the Rookery Building, Chicago, at 2 p. m.

The *New York Railroad Club* holds regular meetings on the third Thursday in each month, at 7:30 p. m., at the rooms of the American Society of Mechanical Engineers, 12 West Thirty-first street, New York City, N. Y.

The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, the fourth Wednesday of January, March, May, September and November.

The *Northwest Railroad Club* meets on the first Saturday of each month, except June, July and August, in the St. Paul Union Station, at 7:30 p. m.

The *Northwestern Track and Bridge Association* meets on the Friday following the second Wednesday of March, June, September and December, at 2:30 p. m. in the directors' room of the St. Paul Union Station.

The *American Society of Civil Engineers* holds its regular meetings on the first and third Wednesday in each month, at the House of the Society, 127 East Twenty-third street, New York.

The *Boston Society of Civil Engineers* holds its regular meetings at Wesleyan Hall, Bromfield street, Boston, at 7:30 p. m., on the third Wednesday in each month.

The *Western Society of Engineers* holds its regular meetings at 78 La Salle street, Chicago, at 8 p. m., on the first Wednesday in each month.

The *Engineers' Club of St. Louis* holds regular meetings in the club's room, Laclede Building, corner Fourth and Olive streets, St. Louis, on the first and third Wednesday in each month.

The *Engineers' Club of Philadelphia* holds regular meetings at the House of the Club, 1,122 Girard street, Philadelphia, on the first and third Saturday of each month. The annual meeting is held on the third Saturday in January.

The *Engineers' Society of Western Pennsylvania* holds regular meetings on the third Tuesday in each month, at 7:30 p. m., at its rooms in the Thaw Mansion, Fifth street, Pittsburgh, Pa.

The *Engineers' Club of Cincinnati* holds its regular meetings at 8 p. m. on the third Thursday of each month in the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati.

The *Civil Engineers' Club of Cleveland* holds regular meetings on the second Tuesday of each month, at 8 p. m., in the Case Library Building, Cleveland. Semi-monthly meetings are held on the fourth Tuesday of the month.

The *Engineers' Club of Kansas City* meets in Room 300, Baird Building, Kansas City, Mo., on the second Monday in each month.

The *Engineering Association of the South* holds its monthly meetings on the second Thursday at 8 p. m. The Association headquarters are at Nos. 63 and 64 Baxter Court, Nashville, Tenn.

The *Denver Society of Civil Engineers and Architects* holds regular meetings at 36 Jacobson Block, Denver, Col., on the second and fourth Tuesday of each month, at 8 o'clock p. m., except during June, July and August, when they are held on the second Tuesday only.

The *Civil Engineers' Society of St. Paul* meets at St. Paul, Minn., on the first Monday in each month.

The *Montana Society of Civil Engineers* meets at Helena, Mont., at 7:30 p. m., on the third Saturday in each month.

The *Civil Engineers' Association of Kansas* holds regular meetings at Wichita on the second Wednesday of each month at 7:30 p. m.

The *American Society of Swedish Engineers* holds meetings at the club house, 250 Union street, Brooklyn, N. Y., and at 347 North Ninth street, Philadelphia, on the first Saturday of each month.

The *Engineers' Club of Minneapolis* meets the first Thursday of each month in the Public Library Building, Minneapolis, Minn.

The *Canadian Society of Civil Engineers* holds regular meetings at its rooms, 112 Mansfield street, Montreal, P. Que., every alternate Thursday except during the months of June, July, August and September.

The *Association of Civil Engineers of Dallas* meets at 803 Commerce street, Dallas, Tex., on the first Friday of each month at 4 o'clock p. m.

The *Technical Society of the Pacific Coast* holds regular meetings at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., at 8 o'clock p. m. on the first Friday of each month.

The *Tacoma Society of Civil Engineers and Architects* holds regular meetings on the third Friday of each month, in its rooms, 201 and 202 Washington Building, Tacoma, Wash.

The *Association of Engineers of Virginia* holds regular meetings at Roanoke, on the second Saturday in each month, at 8 p. m., except the months of July and August.

The *Engineers' and Architects' Club of Louisville* holds regular meetings on the second Thursday of each month, at 8 o'clock p. m., at its rooms in the Norton Building, Louisville, Ky.

American Railway Master Mechanics' Association.

The following circular has been issued from the office of the Secretary:

STANDARD SIZES FOR RAILROAD ROLLING STOCK.

At the last annual convention of the American Railway Master Mechanics' Association, a committee appointed for that purpose made a report on standard bolts and nuts, from which, and the discussion thereon, it appeared that the practice is still very common of making screw-threads over their nominal size. For years different technical associations have been endeavoring to have a standard system of screw-threads generally adopted in all railroad work. The importance of having *all* bolts and nuts of the same nominal size interchangeable would seem to be self-evident, and no argument ought to be required to convince those in authority over such matters of the great advantages which would result to railroad companies from such uniformity. At the risk of writing what is entirely obvious, it may be said here that bolts and nuts of the same nominal size in order to be interchangeable must

First. Be of the same diameter. For this reason, in devising the United States standard system of screw-threads, Mr. Sellers, its author, established ¼, ⅜, ½, ⅝, ¾, ⅞, 1, 1⅛ and 1¼ in. as the standard diameters up to that limit. There are no other sizes in the system except some larger than any of those given, which are not generally used in locomotive or car construction. There is no such thing, for example, as a U. S. standard screw ⅝-and-½ in. in diameter. Such a size is not recognized and has no existence in the system, and if any screws are made, as is often the case, 1/32 or 1/64 of an inch larger than the standard sizes, they cease to be standard. A nut accurately cut with a screw-thread ⅝-in. in diameter cannot be screwed on a bolt which is ⅝-and-1/32-in. in diameter. Oversize, therefore, destroys interchangeability.

Second. Screws and nuts of any given diameter, to be interchangeable, must all have the same number of threads to an inch. This is provided for in the U. S. system. The following fractions represent the diameters of the screws, and the whole numbers the number of threads per inch, ¼-20, ⅜-18, ½-16, 7/16-14, ½-13, ⅝-12, ¾-11, ⅞-10, ⅞-9, 1-8, 1⅛-7, 1¼-7.

Third. The threads must be of a given form and proportion, which was determined when the system was devised.

Fourth. The taps and dies with which the threads are cut on the bolts and nuts must be made so as to conform accurately to the conditions enumerated. To make such tools of a degree of precision which is required in order that bolts and nuts may fit each other accurately and at the same time be interchangeable, requires great skill and much experience and special machinery for the work. All of these have been provided by firms and companies which make a specialty of manufacturing such tools, so that buyers without proper facilities for doing that kind of work are much more certain to get accurate tools by buying them of some of the manufacturers than they will if they make them themselves.

The reason which is usually given for making bolts over-size is that merchantable bar iron is usually much over size, and therefore the surplus material must be cut away by the screw-cutting dies unless the screws are made over size. Manufacturers are shrewd enough to know that they will sell more pounds of iron if it is made larger than its nominal size than they would if it was made of its true diameters, which accounts for the practice of making much iron which is sold in the market too large. Of course the surplus of material thus supplied must be paid for and is usually a dead loss to the purchaser.

In order to guard against the acceptance of oversize iron double caliper limit gauges are now made for its inspection. One of the calipers is larger than the nominal size, and the other is smaller. In buying iron it is specified that it must enter the one gauge and must not enter the other. If the iron is too large or too small it will thus be detected at once on applying the gauges.

After hearing the report of its committee and a full discussion thereon, the Master Mechanics' Association adopted the following resolutions:

First. That this Association commends and emphasizes the United States standard and urges upon all a rigid adherence to the same, and deprecates the use of over or undersized bolts and nuts, and urges all railroad officers to discontinue the use of screws which are not of standard size.

Second. That it is practicable to maintain the United States standard with the methods and gauges available.

Third. The Committee recommends the adoption by the Association of the United States standard for nuts based on rough size regardless of finished nuts.

Four. That the Committee be instructed to prepare a circular calling attention to the importance of maintaining the standards of screw-threads, and that the Secretary send copies of this circular to all members, general superintendents and general managers and railroad newspapers.

Wm. Swanston, Wm. Garstang, T. W. Gentry, W. Lavery, A. Dolbeer, L. R. Pomeroy, Committee.

The Executive Committee of the American Railway Master Mechanics' Association wish further to direct the attention of railroad officers to the advantage that would accrue to railroad companies if consideration were given to the other standards of the Association, particularly those relating to standard driving-wheel centres and form of tires. The Association has established standard sizes of wheel-centres that suit nearly all driving wheels, and a standard contour of flange and trend have been established, which is based on the form most in favor by railroad companies. If it were the practice for railroad officers in purchasing tires to order the Master Mechanics' standard size and shape, makers could always keep a supply ready for quick delivery, and it would not be necessary for railroad companies to carry the amount of stock now commonly found in storehouses. Railroad officers ordering rolling stock ought to specify that nothing but standard sizes and forms should be used.

WHEEL CENTRES AND TIRES.

Your Committee on Standard Diameters for Wheel Centres and Tires desires information as to your practice and experience in connection with the following points:

First—Dimension of wheel centres for driving wheels larger than the standard.

NOTE.—The present standards are 38 in., 44 in., 50 in., 56 in., 62 in. and 66 in., and are arranged to have the diameters in "even" inches, allowing the fractional parts of an inch so apply to the diameter of tires.

(Q.)—From 66 in. up, should the standards advance by 2 in, or 4 in. each?

Second—The present standard inside diameter of tire to produce the requisite holding power by shrinkage for the established diameter of centre is as follows:

38 in.,	less .040 in.	= 37.960 in.	
44 "	" .047 "	= 43.503 "	
50 "	" .053 "	= 49.947 "	
56 "	" .060 "	= 55.940 "	
62 "	" .066 "	= 61.934 "	
66 "	" .070 "	= 65.930 "	

(Q.)—In sizes larger than the standard is the requisite shrinkage proportional to the standards now in force as above?

Third—(Q.)—With the advent of wheels larger than the standard, and the application of driver brakes in service stops, is a positive tire fastening necessary in addition to the holding power obtained by shrinkage?

If so, what fastening do you recommend?

Fourth—(Q.)—Any suggestions as to the means of securing uniformity in rolled outlines of standard tires?

A. E. Mitchell, W. C. Ennis, Thos. Millen, C. A. Thompson, L. R. Pomeroy, Committee. All replies should be addressed to L. R. Pomeroy, 29 Broadway, New York City.

Engineers' Club of St. Louis.

The club met at 8 p. m. at the club rooms, Dec. 7, 1892, President Johnson in the chair; 36 members and three visitors present.

The Committee on Local Data reported that the material was ready for publication, and recommended that it be published. On motion, the Secretary was instructed to proceed with the printing of 1,000 copies of the report, and to have enough bound for the members and other uses of the club.

The Secretary presented his annual report:

The total attendance of members was 532, or an average attendance of 29. We have also had with us 58 visitors. The total number of meetings is now 372. Eighteen papers were

presented by the following members: Professors Woods, Johnson, Brown, Howe, Potter and Nipher, and Messrs. Burnet, Flad, Farnham, Johnson, Burgess, Moore, Laird, Winslow, Hermann, Crow, Bryan and Colby. The club has lost seven members by resignation. Fourteen new members have been elected and one reinstated. The present roll of the club shows that we now have 136 resident members and 49 non-resident and one honorary member, and three elected but not yet qualified.

The Committee on Nominations reported the following nominations for officers for 1893: *President*, Robert Moore; *Vice-President*, B. L. Crosby; *Secretary*, Arthur Thacher; *Treasurer*, Chas. W. Melcher; *Librarian*, R. E. McMath; *Directors*, J. B. Johnson, Geo. H. Pegram; *Members of Board of Managers*, J. B. Johnson, J. A. Laird.

Mr. J. A. Ockerson was also nominated as a candidate for member of the Board of Managers.

Mr. B. J. Arnold read the paper of the evening on "The City Electric Railway Power Station of Little Rock, Ark., and Its Record." The road was constructed in 131 days; including 32 days lost in Sundays and on account of rainy weather, or making 99 actual working days. During this time the entire system of about 20 miles of road was either taken up and new rails and ties laid or the track narrowed from broad to standard guage. At the power house 1,000 cu. yds. of solid slate excavated, over 1,000,000 brick laid, 333,000 feet of lumber erected on the structure and 1,000 H. P. of engines, boilers and condensing machinery put in place during this period.

The questions governing the location of the power house and the obstacles met with were discussed. At certain seasons of the year the river water is exceptionally bad, and special filters were necessary.

Some of the special features of the power house are: First, the general idea of the building on a hillside. Second, the utilization of a short story for a pit room under all the cars. Third, providing for a washing pit under each track. Fourth, placing the line shafting on top of the partition walls. Fifth, the location of the car barn on top of the power house. Sixth, the placing of a summer theatre on top of the structure. Seventh, inclining the tracks for convenience in case of fire. A number of tables showing the cost of fuel and power used were exhibited. The tables showed a very low cost for power. The paper was discussed by Messrs. Schuab, Potter, Flad, Colby, Seddon, Bouton, Kinealy and Wheeler.

Prof. J. B. Johnson's paper on "The Bearing Resistance of Metallic Rollers As Determined by Experiment" was read by title.

Southern & Southwestern Railway Club.

The names of the officers of the club for the next year, elected at the last meeting in November, are printed below: Pulaski Leeds, *President*, Louisville, Ky., S. M. P., Louisville & Nashville; James Meehan, *First Vice-President*, Ludlow, Ky., S. M. P., Queen & Crescent Route; A. W. Gibbs, *Second Vice President*, Atlanta, Ga., Master Mechanic, Richmond & Danville, R. R.; A. G. Steinbrenner, *Treasurer*, St. Louis, Mo., M. C. B. American Rapid Transit Co.; S. A. Charpiot, *Secretary*, Macon, Ga., formerly M. C. B. Central R. R. & Banking Co., of Georgia.

Western Society of Engineers.

At the December meeting of this Society, which was held in the Rookery, Dec. 7, designs for a society pin were submitted by the committee having the matter in charge, and it was voted to have cuts made of the three designs and submitted to the membership for ballot.

A paper on Continuous Rails was read by Mr. A. W. Wright, and also a second paper by Mr. C. H. Hudson on Practical Tests of Compound Locomotives in Service. In Mr. Wright's paper an account was given of experience with an experimental street railroad track in which the rails were made practically continuous and the conclusion was reached that it is perfectly practicable to construct tracks with continuous rails for lengths of from 500 to 1,000 ft. without encountering difficulties on account of expansion and contraction.

Mr. Hudson's paper consisted of a report on the second year's performance of two-cylinder compound locomotives on the East Tennessee, Virginia & Georgia. The final result found was that the compound locomotives had made a saving over the corresponding simple engines of between 24 and 25 per cent. in coal, figured on a car mileage basis. Figures were given showing that the performance of the single expansion engines of this road compared very favorably with locomotive performance on other roads. Altogether, Mr. Hudson's paper was an excellent recommennation of the two-cylinder type of compound locomotive as compared with both simple engines and compound locomotives of other designs.

PERSONAL.

—Col. A. C. Dawes, General Passenger and Ticket Agent of the Hannibal & St. Joseph, and the Kansas City, St. Joseph & Council Bluffs, is seriously ill at Omaha.

—Mr. George J. Gould was elected President of the Manhattan (Elevated) road this week to succeed the late Jay Gould. The office of Vice-President and Director was left vacant.

—Mr. Anthony Sneve, for 13 years Superintendent of the Denver & Rio Grande Express Co., has resigned to take effect the first of the year. Mr. Sneve will go into the banking business.

—Mr. R. S. Seibert, formerly Superintendent of the Pueblo Union Depot Co., has been appointed General Manager of the proposed Nevada Southern with headquarters at The Needles, Cal.

—Mr. Theodore Voorhees, General Superintendent of the N. Y. C. & H. R. R., who is a graduate and Trustee of the Rensselaer Polytechnic Institute, delivered a lecture on Transportation before the students of that Institution at Troy, Dec. 7.

—Mr. George L. Sands has been appointed Assistant Manager of the Wiggins Ferry Co., the East St. Louis Connecting Railway, and the St. Louis Transfer Railway, with supervision of all departments connected with their operation.

—Mr. A. W. Quackenbush, who recently resigned the position of Superintendent of Machinery of the Chicago & Alton road, has accepted a similar position with the St. Louis, Cape Girardeau & Fort Smith, with headquarters at Cape Girardeau, Mo.

—Mr. J. S. B. Thomson, Superintendent of the Richmond & Danville Railroad, who has been ill in Richmond for several weeks, left that city for New York last week for special treatment and to secure absolute freedom from business care for a few weeks.

—Mr. W. E. Gray, General Manager of the Kansas City, Oseola & Southern, and formerly connected with the Chicago & Alton, has been appointed Superintendent of Transportation on the Chicago & Alton with headquarters at Bloomington, Ill., succeeding Mr. S. M. Bates, resigned.

—Mr. Cecil Gabbett has accepted the appointment of General Manager of the Savannah, Americus & Montgomery, which he has had under consideration for some weeks. Mr. Gabbett is now General Manager of the Columbus Southern, and was formerly General Manager of the Central of Georgia.

—The title of Mr. C. H. Platt, General Superintendent of the New York, New Haven & Hartford, was changed this week to General Manager of the company. Mr. Platt was appointed General Superintendent of the road last June, having been previously General Manager of the Harlem line of the New York Central, which includes the operation of the Grand Central Station in New York City.

—Mr. Theodore D. Kline, for the past three years General Manager of the Mexican National Railroad, has resigned that position, to take effect Jan. 1, 1893. His successor will be Mr. E. A. Brown, who is at present Superintendent of the Southern division of the road, having received that appointment in January, 1890, when Mr. Kline was promoted from the General Superintendency of the road to be General Manager.

—Mr. Edward Clark has been appointed Treasurer of the New York & Brooklyn Bridge, at a salary of $4,000 a year. He is a lawyer, and a brother of Corporation Counsel Clark, of New York City, and succeeds Mr. George B. McClellan, who was elected President of the Board of Aldermen of New York in November. Mr. McClellan was appointed Treasurer of the bridge three years ago, the office having previously been an unsalaried one.

—Mr. Orange W. Child, a well known eastern supply man who had an office for many years in New York City, died at Orange, N. J., Dec. 11, aged 68 years. Mr. Child was born in Rutland, Vt., but removed to St. Louis very early in life and became the head of a large hardware firm in that city. During the war he was a contractor for supplies for the army. For the last 25 years he has been connected with railroad work and was one of the builders of the Chicago & Erie road.

—The will of Mr. Jay Gould was read to the family on Dec. 5, three days after his death, and the substance of it was made public a day or two later. The property is all left to relatives, and practically all to Mr. Gould's six children, and the four children who are over 21 years of age are appointed trustees to keep the property intact and manage it as a whole. According to the most prevalent estimates of Mr. Gould's late associates his property will aggregate 100 millions, but the estimate made by the trustees, in presenting the will to the court, is 70 millions. George J. Gould is to receive a special bequest of $5,000,000 and he is made the virtual head of the family, and has the deciding vote on the shares stock held by the estate.

—Mr. Mathew Ellis, formerly Master Mechanic of the Chicago, St. Paul, Minneapolis & Omaha Ry., died at St. Paul, Minn., Dec. 7. Mr Ellis had been connected with this road for 21 years, the greater part of the time occupying the position of Master Mechanic. About a year and a half ago he was compelled, on account of failing health, to relinquish that position, and subsequently spent several months traveling. His health continued to fail, however, and for some weeks he has been hovering between life and death. Mr. Ellis was well known throughout the entire country as one of the foremost of railroad mechanics. The high esteem in which he was held by the employés of the road was evidenced by the attendance at the funeral, in a body, of those employed at the St. Paul shops and delegations from the Hudson shops as well as from the engineers and firemen.

ELECTIONS AND APPOINTMENTS.

Abbeville Southern.—The subscribers to the capital stock have elected the following directors: S. G. McLendon, J. W. Foster, W. E. Bradley, W. J. Lee, J. B. Ward, Z. W. Laney, Sr., R. Newman, N. M. Thornton, J. W. Crawford, W. J. Martin and P. A. McDaniel. The directors have elected S. G. McLendon, President, and W. E. Bradley, Secretary and Treasurer, all of Abbeville, Ga.

Baltimore & Philadelphia.—The annual meeting of the stockholders of the company was held at Wilmington, Del., this week. Thomas M. King, J. B. Washington, William M. Canby, Henry A. DuPont, George de B. Keim, Theodore Frothingham and J. Van Smith were re-elected directors.

Boston & Maine.—At the annual meeting held at Lawrence, Mass., Dec. 14, it was voted to increase the number of director to 17. The following directors were elected: Archibald A. McLeod, Philadelphia; Frank Jones, C. A. Sinclair, Portsmouth, N. H.; Samuel C. Lawrence, Medford, Mass.; George M. Pullman, Chicago; Joseph S. Ricker, Portland, Me., William C. Whitney, George G. Haven, W. S. Webb, New York; Alvah W. Sulloway, Franklin, N. H.; Walter Hunnewell, Richard Olney, H. B. Reed, William T. Hart, Boston; Joseph E. White, Brookline, Mass.; Arthur Sewall, Bath, Me.; Aretas Blood, Manchester, N. H.

Chicago, Fort Madison & Des Moines.—C. C. Wheeler, of Chicago, has been re-elected President of the road; J. F. Tucker, re-elected Vice-President and General Manager, and E. F. Potter, General Superintendent.

Chicago, St. Paul, Minneapolis & Omaha.—A. W. Trenholm, General Agent at St. Paul, has resigned, and S. G. Strickland, General Agent at Sioux City, has been appointed to succeed him. Frank McCabe has been appointed General Agent at Sioux City.

Delaware, Lackawanna & Western.—Charles J. Gummersbach has been appointed Eastern Passenger Agent with office at 429 Broadway, New York, to succeed Nicholas Muller, Jr. resigned. Mr. Gummersbach has been in the office of General Passenger Agent to F. Holivill for the past 17 years. For some time past he has been rate clerk.

Great Northern.—M. Hartman has been appointed Agent in Europe, with headquarters at No. 10 Great Johannesstrasse, Germany.

Inter-colonial.—David Pottinger, General Superintendent of the road has, as already noted, has appointed General Manager. His headquarters will be at Moncton, N. B., instead of at Ottawa, which has heretofore been the headquarters of the General Manager of the Canadian Government roads. Mr. Pottinger has been connected with the railroad service for many years. He was Station Master at Halifax in 1872, was appointed General Store keeper in 1874 and Chief Superintendent in 1879.

Lehigh & Hudson River.—George B. Harris is now Assistant to the President of this company, with office at Warwick, N. Y.; W. E. Bailey has been appointed Superintendent of Transportation, with office at Warwick, N. Y.

Mexican Central.—The San Luis and Tampico divisions have been consolidated, making a division 667.8 kilometres in length, to be called the San Luis division. M. S. McCay has been appointed Superintendent of this division, with headquarters at San Luis Potosi, Mex. J. J. Sullivan has been appointed Superintendent of the Guadalajara division, and the position of Acting Superintendent has been abolished.

New York, Lake Erie & Western.—H. J. Howe, Assistant Engineer of the Susquehanna Division of the Erie, has been appointed Roadmaster of the Second Division of the New York, Pennsylvania & Ohio. His headquarters will be at Galion, O.

New York & Northern.—W. R. Babcock has been appointed Traveling Passenger Agent of this company with office at 353 Broadway, New York City. Mr. Babcock also represents the Central Vermont road, as heretofore.

Norfolk & Western.—J. J. Archer has resigned as Division Passenger Agent of the Scioto Valley and Kenova divisions, and the business hereafter will be conducted by W. B. Bevill, the General Passenger Agent.

Philadelphia & Reading.—General Passenger Agent C. G. Hancock announces the following appointments: R. F. Reaver, appointed Assistant to the General Passenger Agent, to succeed O. C. Briggs, deceased, and Philip U. Grace is appointed Division Passenger Agent of Main Line and Williamsport Divisions, vice R. F. Reaver, promoted. The new Assistant to the General Passenger Agent has been in the service of the passenger department since July, 1877. He was made Chief Clerk of the department on Jan. 1, 1890, and appointed Division Passenger Agent on April 2, 1892.

Rumford Falls & Buckfield.—The annual meeting was held last week and the following directors were chosen: Hugh J. Chisholm, Daniel F. Emery, Jr., William H. Moulton, George C. Wing, George D. Bisbee, Waldo Petengill, R. C. Bradford. The directors elected H. J. Chisholm as President and R. C. Bradford as Treasurer and Clerk.

St. Louis Merchants' Terminal Co.—The annual election resulted in the re-election of the old Board of Directors, with the exception that John T. Davis succeeds Seth W. Cobb, resigned. Major C. C. Rainwater was re-elected President; C. D. McClure and John Whittaker, Vice Presidents; John Overall, Secretary; John D. Perry, Treasurer, and John Greenough, Assistant Secretary.

Savannah, Americus & Montgomery.—Cecil Gabbett has been appointed General Manager of this company, with jurisdiction over the traffic and operating departments, taking effect from Dec. 1, 1892. The office of Superintendent has been abolished and J. W. Matthews appointed Train Master, vice E. T. B. Glenn, resigned.

Texas Trunk.—George T. Atkins, of Dallas, Texas, has been appointed Receiver of the road, to succeed Charles Dillingham, resigned. The road is 46 miles long from Dallas to Kemp; the headquarters of the Receiver being at Houston, Texas.

Waco & Northwestern.—Alfred A. Abel has been appointed Receiver of the road in place of Charles Dillingham, resigned.

West Virginia, Pineville & Tennessee.—The present officers of the company are: H. V. Loving, Louisville, Ky, President; J. D. Blake, Pineville, Ky., Vice President and General Manager; Frank D. Swope, Louisville, Secretary; Bullitt & Shield, Louisville, Attorneys.

West Virginia Southern.—The incorporators are W. W. Welch and Jas. P. Welch, of Gowanda, N. Y.; Henry C. Welch, Hulings, W. Va., Theodore F. Welch and Charles A. Welch, Buffalo. The principal office of the company is at Hulings, Tucker County, W. Va.

York Harbor & Beach.—The annual meeting of stockholders was held at York Harbor, Me., last week. The old Board of Directors was re-elected. The directors organized by choosing Frank Jones, President; Amos Blanchard, Treasurer; Samuel W. Jenkins, Clerk.

RAILROAD CONSTRUCTION.

Incorporations, Surveys, Etc.

Abbeville Southern.—The survey has just been completed from Dothan, Henry County, on the line of the Alabama Midland to Abbeville, Ga., a distance of 28 miles. The road will probably be built as branch of the Plant System, but the present company is an independent organization which has undertaken to secure the right of way and grade the road.

Akron & New Castle.—The charter of this company was filed in Ohio last week, as already noted. The incorporators are Lewis Miller, D. E. Hill, A. L. Conger, George W. Crouse and W. C. Mabley. The company proposes to build a line from the Pittsburgh, Akron & Western, at Akron, to the Cleveland, Canton & Southern at Mogadore in Portage County.

Atlanta Short Line.—It is reported that the Macon & Atlantic, which was sold under foreclosure last week to E. T. Young, of Savannah, representing the bondholders, is to be reorganized under this name. The new purchasers intend to complete the line, as originally projected, to Savannah, Ga.

Baltimore & Ohio.—The Baltimore & Ohio has selected a site for a new passenger station at Fairmont, W. Va., and will begin its erection in the spring. The new line of the Monongahela River road bringing it to a junction with the B. & O., at Fairmont, was completed last week, thus relieving the B. & O. main line of the double traffic consequent upon the Monongahela River road entering Fairmont over its tracks. Work on the belt line at Fairmont has been resumed after having been discontinued several weeks on account of delays in building trestles. The line will now be pushed to completion.

Burlington & Missouri River.—The tracklaying on the Wyoming extension has been completed to Sheridan, Wy., and trains are now running to that point, a distance of over 100 miles from Gillette, Wy., which was the end of track in January. The grading has been completed about four miles beyond Sheridan toward the crossing of the Tongue River, which is about 10 miles distant, and the construction work has been suspended here for the winter.

Chesapeake & Ohio.—This company's Gauley River extension in West Virginia is being pushed forward as rapidly as a large force of hands can do it. The grading is about completed from Gauley Bridge to Twenty-Mile, and the work on the bridges is being pushed forward rapidly, so that the track between those points can be finished before many days. There is likelihood of the line being built up Twenty Mile Creek for the development of timber and coal next spring.

Chicago, Fort Madison & Des Moines.—The completion of the extension of this line to Ottumwa, Ia., was celebrated in that city on Dec. 7, and about 300 excursionists from points along the new line were entertained in the city. The branch is 21 miles long from Libertyville west to Ottumwa, Ia., making the entire length of the line in operation 70 miles from Fort Madison, Ia. E. F. Potter, of Fort Madison, is General Superintendent of the road.

Clearfield & Mahoning.—It is proposed to begin the tracklaying east of the connection with the Buffalo, Rochester & Pittsburgh near Du Bois, Pa., by Jan. 1. The work will advance rapidly, as most of the grading is already done. The line will be operated by the Buffalo, Rochester & Pittsburgh as soon as the construction work has been completed. The length of the road is 26 miles and starts at a point called Jefferson Line, three miles south of Du Bois, Pa., on the Buffalo, Rochester & Pittsburgh, runs southwardly through the towns of Luthersburgh, Rockton, Curwensville to a connection with the Beech Creek at Clearfield. The grading is practically completed and the masonry and bridge work is being finished. The names of the contractors are Capt. John Shields, Flemington, N. J.; Thomas Collins, Bellefonte, Pa., Calvin E. Broadhead, Lithersburgh; George S. Good & Co., Lock Haven, Pa. The Pencoyd Bridge & Construction Co. are erecting the iron work. J. M. Grosh, Ridgway, Pa., is President and J. M. Floesch, Clearfield, Pa., is Chief Engineer.

Denver & Rio Grande.—The extension from Crested Butte to Delta, Col., by the way of the North Fork will be built. The contract for grading 10 miles of the roadbed, has been let to Levi & Moore, and the contract is to be completed by May 1, 1893. The right of way for the entire distance has been secured.

Duluth, Mesaba & Northern.—The branch of the Biwabik Iron Mine was completed on Dec. 8. Regular traffic has been established between Stony Brook Junction and Virginia, Minn.

Fair Hill.—An ordinance to authorize the construction of this road, which is proposed as a freight branch of the Pendsylvania has again passed the city council of Philadelphia, the Mayor having vetoed a previous ordinance. The line is about two miles long and is located through one of the outlying wards of the city. The building of the line will create seven grade crossings, a number of these crossings, however, being over unopened streets, and the opposition to the road is upon this point.

Florida Central & Peninsula.—The award of the contract for the Savannah extension to the Southern Supply Co., of Atlanta, Ga., was noted last week. The contractors have begun work on the southern end of the line near Hart's Road, a point a few miles north and west of Fernandina, Fla. This week work will begin at the northern terminus for the present, a point two miles south of the city limits of Savannah, Ga. The route is almost an air line between the two points, a distance of 132 miles. No detour is made even to reach Brunswick, the most important port in Southern Georgia, the line being 18 miles west of that city, where it crosses the Brunswick & Western and the East Tennessee, Virginia & Georgia roads. This direct route makes a saving of 42 miles between Savannah and Jacksonville over the present route. The contract calls for 70-lb. rails, and the four bridges, over the Altamaha, Satilla, Ogeechee, and St. Mary's rivers, will also be steel structures. Work in the vicinity of the Altamaha River will be begun Jan. 1, and the contract calls for the completion of the road by Sept. 15 next. Bonds to the amount of $2,000,000 have been issued for the construction and equipment of the new branch. New bonds to the amount of $3,428,000 have been issued to retire those bearing a higher rate of interest, and to the extent of $1,500,000 to retire the first preferred stock. With the new branch the company will have 780 miles of road, and the bonded indebtedness will be less than $9,000 a mile.

Kishacoquillas Valley.—Track laying has begun on this road from Reedsville, Pa., toward Bellville, Pa., and it is estimated that six miles will be laid by Jan. 1, 1893. E. A. Tennis and McGovern Bros. have a large force of men and teams at work on different parts of the line, and grading is going rapidly forward. The work is all light and will soon be finished. Trains will be running Feb. 1. The grades are very light, and the road will be put in first class condition as soon as weather permits in the early spring and ballasted with broken rock. F. F. Whittekin, Tionesta, Pa., is Chief Engineer.

Midland Terminal.—The location of the line was finished on Dec. 5 between the Colorado Midland and the Cripple Creek mines. The road will be 31 miles in length, of which 25 is the main line and eight miles branches to the Deerhorn and Gold King camps. The gauge will be 3 ft. The greatest grade will be 5 per cent. The rock work will not be heavy. The elevation at the highest point is 10,183 ft. Three contractor's forces are at work. The rails will probably not be laid before April 1. The line passes through several new mining districts.

Missouri, Kansas & Texas.—Burkitt, Burns & Murphy, contractors for the new line from Texas to Houston, report that the track is laid to the Brazos River, and they will cross the river when the false work is finished, probably this week. The grading is about completed to Houston, there being only a few places remaining to be done. When tracklaying begins on the east side of the Brazos, if no unfavorable weather prevents, 1½ miles will be laid a day. The small trestles along the line will be finished before the track reaches those points. The road will not reach Houston before Jan. 15. The delay has been occasioned by the bridge work. The trestles over White Oak, five in number, will be completed in time for the track. The track from Boggy Tank east to Temple, Tex., has been ballasted, and it is expected that trains will commence running regularly to Temple next week. From Temple to the Brazos River the track is being ballasted.

The San Marcos Division of the Taylor, Bastrop & Houston Division has been opened for freight traffic from Smithville on the main line west to San Marcos, a distance of 52 miles. About 16 miles of this branch, between San Marcos and Lockhart was an old branch, without connection with the main line.

It is announced that the company will put on a through train over its own line from St. Louis to Houston, Tex., on Feb. 15. It is expected to have the Missouri, Kansas & Eastern ready for operation by that time. This is the new St. Louis line of the company now building from Franklin, Mo., along the Missouri River to St. Louis. The new line to Houston will also be ready for traffic by that date.

Nashville, Chattanooga & St. Louis.—About 10 miles of track has been laid south of Huntsville, Ala., toward the Tennessee River, leaving about five miles of track to build to reach Hobbs Island, which is to be the terminus of the branch. The grading was completed this week, and if the weather is favorable all the track will be laid before Jan. 1. A. N. Nichols & Co., of Huntsville, Ala., are the contractors.

Nevada Southern.—Articles of incorporation were filed this week in Colorado by Isaac E. Blakey, President, Walter F. Crosby, and George C. Manley, Secretary and Treasurer. The capital stock is $2,000,000. The company will immediately construct, without sub contracting, a line about 30 miles in length, surveys for which have been completed. The line will begin at Goff's Station, 30 miles west of Needles, Cal., on the Atlantic & Pacific, and will extend northwest in San Bernardino County, to the New York and Vanderbilt group of mines. R. S. Seibert, General Manager, will superintend the construction of the line.

Newfoundland.—R. Reid, contractor, of Montreal, has just returned home from Newfoundland, where, for some months past, he has been engaged on railroad construction on behalf of the Newfoundland Government. A road is being built by the Government from St. John's, skirting the coast in a northwesterly direction to Hall's Bay, a total distance of 270 miles of road, Mr. Reid being the contractor of 140 miles of road, which is nearly completed and ballasting well advanced. Mr. Reid says that a valuable discovery of coal about 50 miles from the line has been made, the seam being 15 or 16 ft. in thickness.

New Roads.—It is stated that a company is being organized to build a railroad from the Cumberland Valley at Newville, Pa., to Doubling Gap Springs via Cloverdale Lithia Springs. From Doubling the line will continue to Landisburg, Perry County, it is also said, and there connect with the Perry County road.

Oklahoma Midland.—Articles of incorporation have been filed at Oklahoma City. The directors named are A. J. Vanlandingham, H. M. Fickinger, C. R. Jones, W. H. Ebry and Ledru Guthrie. The road has for its starting point Joplin, Mo., and is to enter the territory near the northeast corner, crossing the Quawhan, Cherokee and Creek reservations, thence southwesterly across Oklahoma. Hon. L. Guthrie is General Attorney.

Owensboro, Falls of Rough & Green River.—This company will have eight miles of track, from Horse Branch, Ky., to Rough Creek, with a bridge over Rough Creek, completed by Jan. 1. Another force is laying track from Forgsville, Ky., south, and will have five miles completed by Jan. 1, to Carters' Cut, which is a 40-ft. rock cut 800 ft. long. This company is also laying track on the city extension, at Owensboro, which is about three miles in length, taking in the river front, which it is expected to have completed and ready for operation March 1, 1893. M. B. Mann, of Owensboro, Ky., is Vice-President and General Manager.

Pennsylvania.—A branch line is being built from a point on the Chestnut Hill branch, between Westmoreland and Queen Lane stations, Philadelphia, extending for a distance of about three-quarters of a mile parallel to Roberts avenue to a connection with the Midvale Steel works. The work is quite light and is being vigorously pushed by Contractor Covode, under the direction of Assistant Engineer W. H. Colesberry. There is one overhead crossing on this line, namely, at Wissahickon avenue, and the bridge is now being erected.

The Engelside Railroad has just been organized and constructed. It leaves the line of the New York division of the Pennsylvania at Oxford street, near Ridge avenue station, and extends along Thirty-second street to a connection with the Bergner and Engel Brewing Co.'s plant, with branches on Master and Thompson streets. This line makes connection with a number of breweries, and although its total length, including spur branches, is only about one mile, it will bring a large tonnage to the railroad.

The grading and masonry work on the Fort Washington branch, extending from Allens Lane Station on the Chestnut Hill branch, to a connection with the Trenton cut-off, near Fort Washington, Pa., is about completed, but the track will not be laid until spring.

Roxborough.—Slow progress is being made in the construction of the new branch of the Pennsylvania which is to extend from near the Chelton avenue station of the Chestnut Hill Branch, to Corson's station on the Trenton cut-off. Contractors Keller & Crossan have only a dozen men at work on the lower end of the line. Contractor John Dyer, at the upper end, has 20 men at work. After Jan. 1 300 laborers will be put to work by the contractors.

Sioux Falls, Yankton & Southwestern.—A survey for the proposed line northeast to Madison, S. D., was completed last week. The new line will be about 40 miles long from Sioux Falls, S. D., to Willow Creek and along Clear Lake Valley to Madison in Lake County. The grade is very light, and the cost of constructing the road will be comparatively small. Melvin Grigsby, of Yankton, S. D., will have charge of the construction of the road. The grading will probably begin as soon as the contractors are through with the grading on the main line of the road, which is now being built from Sioux Falls to Yankton, S. D.

Southwest Arkansas & Indian Territory.—A survey has just been finished for six miles of an extension of this road from Okolona, Clark County, Ark., to Antoine, Pike County. The grading and bridging are completed, and only about two miles of track is to be laid, which will be completed within a week. This will make the road 34 miles long from Hebron to Antoine, Ark., crossing the St. Louis, Iron Mountain & Southern road at Smithton. The engineer is now locating a 12-mile extension from Antoine to the centre of Pike County, which will be built the coming year. J. H. Crawford, of Arkadelphia, is President; C. E. Brooks, of Smithton, General Manager, and N. S. Woods, Arkadelphia, Chief Engineer.

Stillmore Air Line.—About 200 men are now working on this line near Stillmore, Ga. The charter for the road was recently secured in Georgia, and provides for a line from Swainsboro via Stillmore to Collins in Tatnal County, Ga. The grading is now nearly completed between Stillmore and Collins, the contractor being J. M. Willis, of Stillmore, Ga. George M. Brinson is President and J. D. Overstreet is Superintendent and Chief Engineer. The headquarters of both are at Stillmore, Ga.

Toledo, Columbus & Cincinnati.—It is reported that work has been commenced recently on the proposed extension to Columbus, O. The present terminus of the line is Ridgeway, O., and work is reported to be now going on south of that town. The distance to Columbus is about 46 miles, and it is said that the line will be completed in March.

Toledo, Walhonding Valley & Ohio.—The ballasting and finishing work on this line is now so nearly completed that it will probably be opened by the Pennsylvania for regular traffic in a few weeks. The line was built this year from Loudonville on the Fort Wayne division east of Mansfield, O., southeast to Cosbocton on the Panhandle division, a distance of about 46 miles. The road was built to give a more direct route between Toledo and the coal fields, and the line will be operated in connection with the old division between Toledo and Mansfield.

Turtle Creek Valley.—Surveys for the extension from a point below Delmont to Saltsburg, Pa., have been completed and work was commenced last week. Rails will be laid from Murraysville to a point near Nie's mills this winter and in the spring to Saltsburg, where connection will be made with the West Pennsylvania road. Some of the richest coal land in western Pennsylvania will be tapped in Salem township, Westmoreland County.

Union Pacific.—It is announced that the Red River branch of the Union Pacific, Denver & Gulf, starting from near Trinidad, will be extended next spring about ten miles down the Red River.

A corps of civil engineers is in the field finishing the survey for an extension of the branch of the South Park line toward the Irwin coal lands.

Washington, Burnt Mills & Sandy Springs.—The directors have recently ordered a survey made for the line, which will be a local road in Montgomery county, Md., about 10 miles long, connecting Burnt Mills and Sandy Springs. Dr. C. G. Stone, of Brightwood, D. C., is President, and George W. Cissel, of Washington, D. C., is Vice-President.

Washington & Chesapeake Beach.—The contract for the construction of this road, ready for operation, and for the improvement of the company's beach property on Chesapeake Bay has been awarded to Godefferoy & How, of 45 Broadway, New York City, the builders of the Baltimore & Eastern Shore Railroad, in which they still have a large interest. This road will be about 27 miles long and will extend from a point on the Baltimore & Potomac near Washington, southeast to Chesapeake Beach, and it is proposed to begin construction about Jan. 15. The line will connect by ferry across Chesapeake Bay with the eastern terminus of the Baltimore & Eastern Shore road. T. W. Tyrer, of Washington, D. C., is Secretary and Manager of the company, and L. H. Hyer is Chief Engineer.

West Virginia, Pineville & Tennessee.—The present route of this road is from Pineville, Ky., easterly up Straight Creek, about three miles to the coal mining plant of the Southern Land Improvement Co., now leased to the Central Appalachian Co. (Ltd.), at Truxton. The contemplated route is up the Right Fork of Straight Creek near its source, and thence toward Paintsville, with another line extending up the Left Fork of Straight Creek to its source to Beattyville, with an extension from Pineville, southeasterly up Clear Creek toward Big Creek Gap to the Tennessee State line, on which considerable grading has been done recently, with a branch up Little Clear Creek to Middlesborough, Ky. Preliminary surveys have been made over most of this route and the location for a portion of the distance. An extension up the Right Fork of Straight Creek of about one mile will be made very soon. The contracts will be let on securing right of way and making the location. About eight miles will be built up the Left Fork of Straight Creek next year. The grading on the Clear Creek branch has been stopped in contemplation of building the line up Straight Creek, easterly, which is needed for immediate use. The railroad company owns about $125,000 of property in track, right of way, equipments, etc., which is at the present not bonded. The re-organization of the company will be effected very soon and new directors elected. J. D. Blake, Pineville, Ky., is Vice-President and General Manager.

GENERAL RAILROAD NEWS.

Boston & Maine.—At the annual meeting this week it was voted to change the time of the annual meeting from December to the second Wednesday in October and to have the fiscal year end June 30. It was voted to issue 50-year four per cent. bonds to an amount not exceeding $2,000,000 for the purpose of funding and refunding the indebtedness of the company falling due Jan. 1.

At a dinner of the Boston Merchants' Club Dec. 8 President McLeod stated in a speech that the company would as soon as possible build an adequate passenger station in Boston.

Central of Georgia.—It is reported that the recent conference of the directors and reorganization committee of the company in New York had reached the basis of a reorganization plan. It is said to involve the issue of first mortgage five per cent. bonds to take the place of the present first mortgage seven per cent. bonds which mature on Jan. 1. Sacrifices are to be asked of the holders of some of the junior liens in exchange for their bonds for the new five per cent. issue, but new preferred stock is to be given as compensation. The existing common stock is to be left unchanged, and no foreclosure of the property is contemplated. The floating debt is to be paid for in the new bonds. No official confirmation of this scheme has been published.

Chicago, Kansas City & Texas.—The United States Court has ordered foreclosed mortgages held by the Central Trust Co. against this railroad for $438,000, and

against the Kansas City Bridge & Terminal Railway Co. for $1,000,000. Webster Withers and Walter H. Holmes are appointed Masters in Chancery for the respective properties. The former company now operates about 22 miles of road in Missouri from North Kansas City to Smithville and the Kansas City Bridge & Terminal Co., owns the partly completed bridge across the Missouri River which was begun in 1890. Both enterprises were projects of Willard E. Winner, of Kansas City, who failed two years ago. A syndicate of Eastern bondholders headed by Theodore C. Bates, has been organized to buy in the property, and after acquiring a clear title, complete the work.

Connecticut River.—The directors have voted to lease the road to the New York, New Haven & Hartford for 99 years, the agreement having been made on Tuesday last and possession given on Wednesday, under a temporary contract. It is said that there is no doubt of the ratification of the agreement by stockholders. The Connecticut River road proper extends from Springfield, Mass., northward to Keene, N. H., with six miles of branches, but it controls the Sullivan County and the Vermont Valley roads, so that the lease practically extends the main line of the New Haven road northward from Springfield to Windsor, Vt., 14 miles south of White River Junction. All of this is practically owned by the Connecticut River, except 10 miles between South Vernon and Brattleboro, Vt., where the track of the New London Northern is used. The New Haven road thus increases its total mileage from 850 to 970 miles. The stockholders of the leased road are to receive the same dividends as those of the New York, New Haven & Hartford, and they are to have equal rights in the distribution of the $15,000,000 in debenture certificates of the latter road, lately authorized. Connecticut River stock has been selling at 235 and pays eight per cent dividend; New Haven stock sells at 235 and pays a 10 per cent dividend. The capital stock of the Connecticut River is $2,580,000. Mr. J. A. Rumrill, one of the principal owners, and a director in the Boston & Albany says that the bargain is approved by the latter company. The Connecticut River is a profitable property, the road being double track and in first class condition. It is a competitor of the New Haven road's Northampton division at Holyoke and Northampton, and slightly so at other places, but this can hardly be regarded as sufficient reason for the lease, and the real reason must be looked for in the general tendency of small roads to seek the protection of their larger neighbors, and in the danger to the New Haven road of the Boston & Maine seeking this property as a means of further adding to its strength in Western Massachusetts, though such addition would not be immediately important in a strategic view.

Fonda, Johnstown & Gloversville.—A controlling interest in the road has passed into the hands of H. Walter Webb, the Third Vice-President of the New York Central road. This road is about 28 miles long, and extends from Fonda, on the New York Central & Hudson River road, to Northville, N. Y. Mr. Webb several weeks ago purchased a considerable amonnt of the stock. His personal holdings, together with the proxies voluntarily placed in his hand, give him control of the road. The report that the New York Central road is interested in this transaction is pronounced erroneous by Mr. Webb.

Grand Tower & Cape Girardeau.—The United States Circuit Court, at Springfield, Ill., has issued a decree for the sale of this road at foreclosure in the suit of the Farmers Loan & Trust Co., of New York. The road was built in 1890 and extends from Grand Tower southwest to East Cape Girardeau, Ill., and is operated by the Grand Tower & Carbondale road.

Houston & Texas Central.—Justice Lamar, of the Supreme Court of the United States, on application of the minority stockholders of the company, has granted an order restraining the Receiver from delivering the road to the reorganized company pending appeal.

Little Falls & Dolgeville.—The road was formally opened for passenger traffic on Dec. 14, between Little Falls and Dolgeville, N. Y., 11 miles. Freight trains have been running over the line for several months. The principal work delaying the opening of the line for passenger traffic has been the work on a cut on the north end of the line.

London & Port Stanley.—At a special meeting of the City Council, of London, Ont., an offer for the lease of this road was received from F. S. Miller, of Cleveland, O. His figure is $28,000 a year, payable quarterly, taxes and a percentage of the receipts exceeding a named sum, the road to be returned in good repair at the end of 20 years. He also promises to put on a line of three steamers between Port Stanley and some Ohio port and build a large hotel at the former place. The Council decided to take the proposal under consideration and communicate with Mr. Miller and invite him to visit the city.

Metropolitan West Side.—The stockholders have recently authorized the directors of the company which proposes to build an elevated road in Chicago, to issue $15,000,000 of new bonds to build the road. Bonds are to bear five per cent. interest, and are issued to George G. Havers and Adrien Iselin, Jr., of New York City.

Mobile & Girard.—The application of Charles T. Pollard, as Receiver, appointed by the Alabama State Court, before the United States Court, at Montgomery, Ala., asking for an order to the Receiver of the Central of Georgia to turn over to him the rolling stock of the company, was argued Dec. 6, but the application was denied. The case will be appealed.

New York, New Haven & Hartford.—The directors have voted to issue convertible debenture certificates to an amount not exceeding $15,000,000 and a circular has been issued to the stockholders, explaining the proposition. The directors say: The increase of traffic and earnings derived from the expenditure for improvements of the company's plant and equipment during the last five years has been so manifest that the board of directors has determined to complete them as speedily as practicable. The full advantages anticipated cannot be realized until they are finished. More than $10,000,000 has already been expended upon them, of which $800,000 has been provided from increase of capital stock. The board does not think it wise to issue at par the company's stock upon which immediate dividends at the present rate might be expected, or to lessen the dividends for the purpose of improving the property, or to create an interest adverse to the stockholders by issuing mortgage bonds. The company, therefore, proposes to issue on April 1, 1893, at par, convertible debenturd certificates to an amount not exceeeding $15,000,000. The proceeds of these convertible debenture certificates will be held as a trust fund, to be disbursed only for the following purposes: For the completion of four tracks on the New York division, including the Harlem River branch; for the completion of two tracks between New Haven and New London; for terminals, notably at Providence, New London, New Haven, Bridgeport and New York; for additions to the company's motive power and equipment, an extension of its block signal system and the elimination of grade crossings; for the payment of the public debt of the company already incurred for the above purposes. Stockholders may subscribe for these convertible debenture certificates during March, 1893, in the proportion of 40 per cent. of their then holdings of the company's capital stock. Stockholders may assign their right to subscribe. As the proceeds of these convertible debenture certificates cannot at once be expended with advantage, subscriptions will be payable in instalments, and negotiable receipts will be issued therefor. These instalments of 25 per cent. will be payable as follows: On April 1, 1893; on Oct. 1, 1893; on April 1, 1894, and on Oct. 1, 1894. In accordance with the understanding in 1889, when the company was authorized to increase its capital stock, an opportunity will be given to the holders of stock in its leased lines to become stockholders of this company, January and February, 1893. They will thereby become entitled to subscribe during March for convertible debenture certificates; exchanges to be made upon the following basis: This company will issue and deliver of its stock one share for one share of the New York, Providence & Boston; one share for one share of the Hartford & Connecticut Valley; one share for eight shares of the preferred stock of the Housatonic; four shares for 13 shares of the New Haven & Derby; one share for four shares of the Danbury & Norwalk; and (with the approval of the committee provided for by the company's amended charter) two shares for five shares of the stock of the New Haven & Northampton; two shares for five shares of the preferred stock of the Boston & New York Air Line; one share for one share of the Naugatuck; three shares for four shares of the Shore Line. The present stock is over $23,000,000, paying 10 per cent. dividends.

This road has assumed control of the Connecticut River road on a two months' contract, and the directors have agreed to lease it, as stated elsewhere. The stockholders of the Connecticut River are to have the privilege of subscribing for the new debenture bonds.

Oregon Pacific.—The attempt to formulate a satisfactory plan of organization having failed, the bondholders will endeavor to raise by a pro rata assessment the sum necessary to buy the road. The sale by order of court will be on Jan. 15 next, and the court has fixed $1,250,000 as the minimum price.

Pittsburgh, Ohio Valley & Cincinnati.—The Pennsylvania company has opened this line from Bellaire, O., to Powhattan, O., 30 miles, and has two daily passenger and freight trains running. The work of extending the line on down the Ohio River has been partially suspended for the winter.

San Antonio & Aransas Pass.—The Reorganization Committee has changed the original plan or reorganization submitted a year ago. The committee now recommends that authority be given for the issue of $21,600,000 first mortgage four per cent. 50 year bonds guaranteed by the Southern Pacific railroad, of which $2,700,000 will be reserved for future extensions, and $1,800,000 for improvements and equipment, leaving $17,000,000 for purposes of reorganization. The committee will use their judgment in determining whether there shall be a foreclosure sale. Securities must be deposited on or before Jan. 19, 1893.

Savannah, Americus & Montgomery.—S. H. Hawkins, of Americus, Ga., President of the road, who was appointed temporary Receiver last week, was confirmed as Receiver at a hearing this week. T. Edward Hambleton, of Baltimore, was appointed Receiver with Mr. Hawkins, the latter appointment being made at the petition of the holders of about $2,000,000 of the company's bonds who are represented by Hambleton & Co., of Baltimore.

TRAFFIC.

Traffic Notes.

District Attorney Ady, of Kansas, has appealed the Trans-Missouri Freight Association case to the United States Supreme Court.

It is announced that the Panama Railroad has chartered two steamers to run between New York and Colon, the service to begin on the expiration of the existing contract between the road and the Pacific Mail Steamship Co.

Press dispatches from Tacoma, Wash., report that passenger rates to Chicago and other eastern points are seriously cut. Some of the railroad agents dispute the accuracy of the reports, and it seems that the reduced rate tickets are bought mostly or wholly from brokers.

The Secretary of the Treasury has issued regulations for the enforcement of the provisions of the act of July 16, 1892, for the collection of statistics of exports from the United States to foreign countries by railroad. Customs officers are ordered to require invoices to be furnished by the railroads for every shipment. Heretofore there has been no way to compile these statistics except by reference to Canadian or Mexican import reports, which are not satisfactory. The law provides that there shall be two manifests, one prepared by the shipper and the other by the railroad company, both showing the number of articles, description, quantity, value, and whether free of duty or duty paid.

A dispatch from Sioux City, Ia., reports that coal dealers are complaining loudly on account of the alleged confiscation of coal by railroad companies. The weather has become cold and it is claimed that suffering is imminent. At one place it is said that the citizens took 30 tons of coal from a railroad shed by force and apportioned it among those who needed it.

The collector of customs at Marquette, Mich., has collected about $32,000 in tolls on freight through the St. Mary's Canal since the proclamation of President Harrison in August last, imposing these tolls in retaliation for the action of Canada in charging tolls at the Welland Canal which were greater in the case of vessels bound for American ports than in the case of those bound for Montreal.

The Boston & Maine and the Maine Central have arranged to put on a line of tourist sleeping cars between St. John, N. B., and Boston. The Maine Central has ordered four new cars of this kind. There seems to be a considerable amount of this class of traffic in that territory.

The Kanawha Dispatch has reduced freight rates from New York to the Mississippi River to 40 cents, first class, and 35 cents second class. It is declared that the reductions are made to meet contract rates of various Trunk lines. The new Kewaunee route is charged by Chicago lines with making secret reductions on Minneapolis flour. The limit of the capacity of the line is 72 cars a day, owing to the fact that the freight must all go across Lake Michigan on the two ferry boats, which can make about a trip and a half a day with 24 cars per trip: but the other lines are disturbed, all the same.

Prominent officers of the principal Southern railroads had a meeting last week to consider a proposition to establish a line of steamships from Savannah or Brunswick, Ga., to Europe in order to promote export trade from the West by one or both of these ports. It is said that it was informally agreed to subsidize the ocean carriers to the extent of 5 cents per 100 lbs. on all export freight, in order to compensate them for the lack of westbound cargoes, which lack is the chief obstacle to the establishment of steamship lines at these ports. The proposition is to pro-rate the 5 cents among all the roads over which the freight is carried.

It is said that important reductions in service by various ocean lines will take place in the near future, there being practically no grain or cotton moving. As these are by far the larger features of ocean traffic, their absence practically paralyzes the business. Cotton is higher in price here than in England. Large stocks have accumulated there and strikes have delayed manufacture, so that an abnormal condition of affairs prevails. Last week freights on cotton from New York to Liverpool were offered at $1 a bale, less than half the usual rate. A moderate amount of cotton is moving, but it is all on old contracts. There are also unusually large stocks of grain abroad. Last week's offers in New York for freights at 2½ cents a bushel had no takers, and no grain is shipped except on old contracts. Not a bushel of grain was contracted from New York to Liverpool last week. The shipments of wheat from New York last week, to all foreign ports, aggregated only 887,000 bushels, against 2,200,000 bushels for the corresponding week last year. Of corn 200,000 bushels were shipped, against 400,000 last year.

Chicago Traffic Matters.

CHICAGO, Dec. 14, 1892.

The agreement of the Colorado lines to discontinue through ticketing over the Union Pacific has resulted in a sharpening of competition, and the Union Pacific is charged with paying $5 commission on passengers between the Missouri River and Colorado. The Union Pacific retorts with a similar counter charge.

The Trans-Missouri roads, at their meeting here last week, accomplished nothing in the way of formal action, but they virtually agreed to maintain freight rates pending an attempt to effect a permanent organization. The committee on this subject reported a plan for what may be called an informal agreement. It provides for the appointment of three rate committees—one for Nebraska, one for Kansas and one for Colorado-Utah traffic. A permanent secretary is to be present to keep the records of all the meetings, but every meeting will elect its own presiding officer from among the members present, and there is no provision for a regular chairman. The office will probably be at Kansas City, and it is understood that Mr. McFadden will be retained as secretary.

The meeting of the lines of the Western Passenger Association yesterday was entirely harmonious, and it is probable that the Chicago & Alton will become a member of the association in a very short time. B. D. Caldwell, James Charlton, John Sebastian, P. S. Eustis, W. F. White and J. C. Bond have been constituted a special committee to revise the agreement and report at the next meeting. The condition on which the Chicago & Alton consented to become a member is understood to be that the Jacksonville Southeastern come into the association.

Eastbound shipments of freight, exclusive of live stock, for the week ending Dec. 10, aggregated 77,100 tons, against 81,484 for the preceding week, a decrease of 4,296 tons, and against 98,949 for the corresponding week last year, a decrease of 21,761 tons. The Michigan Central took 12,358 tons; Wabash, 3,881 tons; Lake Shore, 14,598 tons; Fort Wayne, 8,494 tons; P., C., C. & St. L., 9,964 tons; Baltimore & Ohio, 3,500 tons; Chicago & Grand Trunk, 6,438 tons; N. Y., C. & St. L., 9,099 tons; Chicago & Erie, 6,277 tons; C., C., C. & St. L., 2,914 tons. Lake shipments amounted to 10,093 tons, against 46,025 for the preceding week, a decrease of 35,932 tons.

The Interstate Commerce Commission.

The commission has announced its decision in the case of the Potter Manufacturing Co. against the Chicago & Grand Trunk, the Atchison, Topeka & Santa Fe, and the Southern Pacific. The opinion is by Commissioner Clements and orders that the rate on unfinished bedroom furniture shall not exceed 85 per cent. of the rate on finished furniture.

The Work of the Demurrage Bureaus.

The National Association of Car Service Managers has issued a statement showing the cars reported and average detention in the principal associations for the three months to Oct. 1 last. It is as follows:

Name of Association.	No. of Cars Reported.	Average Detention.
Baltimore and Washington	108,673	1.53
Alabama	47,170	1.21
Central New York	92,482	1.76
Chattanooga	8,993	1.56
Chicago	259,513	1.59
Cincinnati	77,530	1.25
Cleveland	90,271	1.78
Colorado and Denver	50,743	1.78
Columbus	45,655	1.67
Detroit	63,787	1.59
Erie	8,443	1.50
Grand Rapids	18,738	1.99
Illinois	30,599	1.44
Indiana	100,602	1.70
Lake Superior	58,460	1.39
Louisville	30,627	1.67
Mahoning and Shenango Valley	74,319	1.68
Memphis	16,325	1.36
New York and New Jersey	169,382	2.03
New Orleans	7,820	2.62
Northeastern Pennsylvania	142,327	1.37
Philadelphia	354,236	1.34
Pittsburgh	309,136	1.12
St. Louis	91,956	2.26
Toledo	24,722	1.60
Terminal Dispatch (St. Paul and Minneapolis)	148,110	1.29
Utah	10,073	1.96
Virginia	61,815	1.63
Western (Omaha)	58,538	2.05
Western New York	111,561	2.05
Wisconsin and Michigan	175,928	1.27
Total	2,854,468	1.54

GEO. WESTINGHOUSE, JR., President. T. W. WELSH, Supt. JOHN CALDWELL, Treasurer. W. W. CARD, Secretary. H. H. WESTINGHOUSE General Manager.

THE WESTINGHOUSE AIR BRAKE COMPANY

PITTSBURGH, PA., U. S. A.,

MANUFACTURERS OF THE

WESTINGHOUSE AUTOMATIC BRAKE

The WESTINGHOUSE AUTOMATIC BRAKE is now in use on 24,000 engines and 325,000 cars. This includes (with plain brakes) 252,000 freight cars, which is about 23 PER CENT. of the Entire Freight Car Equipment of this country, and about 80 per cent. of these are engaged in interstate traffic, affording the opportunity of controlling the speed of trains by their use on railways over which they may pass. Orders have been received for 173,000 of the Improved Quick-Action Brakes since December, 1887.

The best results are obtained in freight train braking from having all the cars in a train fitted with power brakes, but several years' experience has proven conclusively that brakes can be successfully and profitably used on freight trains where but a portion of the cars are so equipped. Below is a graphical illustration of the progress made in the application of the Automatic Brake to freight cars since its inception.

Year.	No. per year.	Grand total
1881	105	105
1882	1,085	1,190
1883	4,966	6,156
1884	15,051	21,207
1885	10,410	31,617
1886	8,946	40,563
1887	9,281	49,844
1888	27,696	77,540
1889	26,065	103,605
1890	50,502	154,107
1891	39,061	193,168

193,168 freight cars fitted with the Westinghouse Automatic Brake, which is nearly 20 per cent. of the Entire Freight Car Equipment of this country.

E. L. ADREON, Manager. JOHN B. GRAY, Agent. C. C. HIGHAM, General Supt.

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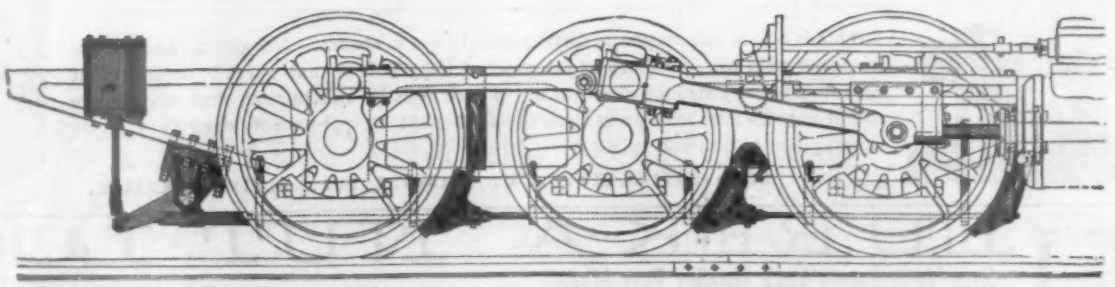


Standard Outside Equalized Pressure Brake, for two or more pairs of Drivers furnished to operate with either STEAM AIR or VACUUM.

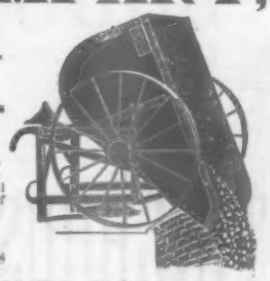
THE AKRON TOOL COMPANY,

AKRON, O.,

Manufacturers of McNEIL'S PATENT BALANCED CHARGING BARROW—AUTOMATIC DUMP.

ONE MAN CAN HAUL A TON.

For Use on Docks, R. R. Coaling Stations, Boiler Rooms Iron Works, Foundries, Etc.



OFFICE OF UNION ROLLING MILL CO.,
CLEVELAND, O., Oct. 15, 1892.

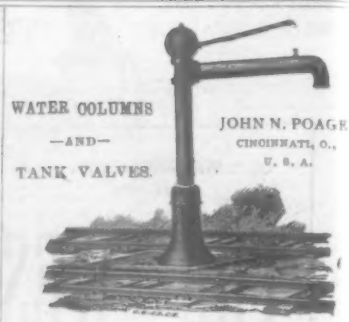
The Akron Tool Co., Akron, O.:

GENTLEMEN: Referring to your letter of recent date, we would say that we were one of the first to use the McNeil Charging Barrow. In fact we believe we were THE FIRST to use them. We now have twenty-four of them and are very well satisfied with them. We can confirm the testimony of Sept. 16, 1890, a copy of which you have in your circular, after two more years' use of the barrows.

Yours very truly, UNION ROLLING MILL CO.,
WILLARD FULLER, Supt.

We Also Manufacture a Full Line of STEEL WHEELBARROWS for All Purposes.

WRITE US FOR DESCRIPTIVE CATALOGUE, PRICES, ETC.



WATER COLUMNS —AND— TANK VALVES.

JOHN N. POAGE
CINCINNATI, O., U. S. A.

THE AMERICAN WASHER & MANUFACTURING CO.

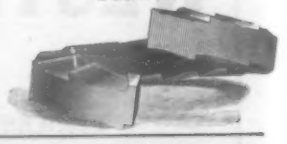
EDWIN W. HINE, President. L. L. STURGES, Secretary and Treasurer. H. A. HARVEY, Vice-President.

THE AMERICAN "HARVEY RIBBED" NUT LOCK.

Patented.

A Resilient Spiral Spring Washer with Ratchet-Shaped Teeth.

This is a positive lock, with spring temper, and will not cut thread of nut or bolt.



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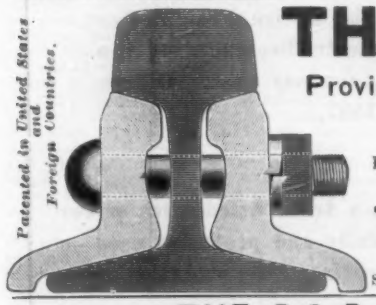
CORRESPONDENCE AND ORDERS SOLICITED. SAMPLES FURNISHED FREE ON APPLICATION AND SENT TO ANY ADDRESS.

Patented in United States and Foreign Countries.



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Provides for Vibration and Retention of Elasticity, Reversible, and Does Not Injure Threads of Nut or Bolt.

Extensively used on Railroad Track, Split Switches, Frogs, Crossings, Car and Locomotive Frames, Draft Riggings, Bridges Machinery, etc.

Inspection of Merit Solicited. Samples and Description Forwarded Gratuitously.

THE POSITIVE LOCK WASHER CO., Makers,

Works, 291 to 301 New Jersey R. R. Ave., Newark, N. J.

SAM'L. SCHOCH, Prest. STEPHEN D. BARNETT, Treas. and Mgr. JOHN B. ROSS, Sec'y and Sup't.

Simple. Easily Applied. Very Effective.

THE NATIONAL LOCK WASHER

THE ONLY POSITIVE NUT LOCK IN COMBINATION WITH ELASTICITY.

Seventy Millions in Use in Railroad Track

For Use on All Kinds and Classes of Work.

Made for all sizes of bolts.

A trial is requested.

Samples free of expense.

THE NATIONAL LOCK WASHER CO, Newark, N. J.

Excelsior Automatic Nut-Lock and Fish Plate Spring

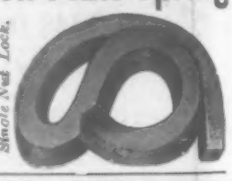
These Nut Locks have been adopted by the New England Road-Masters, in Conventions held at Hartford, Conn., Oct. 19 and 20, 1887, and Boston, Mass., Aug. 15 and 16, 1888, as the best Nut Locks known.

Sample lots furnished for trial, free of expense, by forwarding the distance between centres of fish-plate bolts. Correspondence and orders solicited.

RUFFNER & DUNN,

Patentees and Sole Mfrs., SCHUYLKILL FALLS, Philadelphia, Pa.

Single Nut Lock.



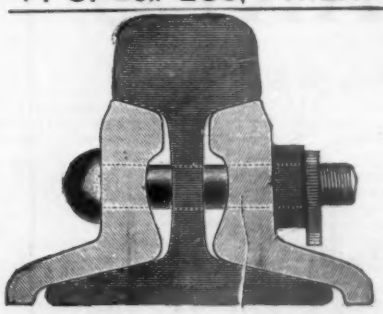
THE STANDARD COMBINATION TIE PLATE AND BRACE

POSSESSES THE FOLLOWING MERITS:

1. It prevents absolutely the canting of the rail into the tie, thereby greatly increasing the life of the tie.
2. It prevents the rails from spreading or canting over and wearing one side only.
3. The combination of the brace and plate obviates the necessity of spiking the rail and brace separately, thereby saving two spikes and securing the service of the *inside* spike for *holding* the rail; it also prevents the rail from working up and down, and laterally, thus making it impossible to wear the *neck of the spike*.
4. The plate and brace being made of malleable iron, is practically indestructible.

The tie plate and brace is especially useful for curves and guard rails, and also on bridges, whether the rail is laid on ties or on stringers. A tie plate without a brace will not save the head of the spike. A brace without a tie plate will not save the tie, and in a short time the rail will wear into the tie.

P. O. Box 288, PHILADELPHIA, PA. WILLIAM H. PHILLIPS.



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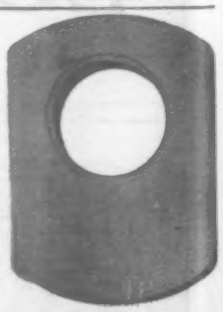
Patented in United States and Abroad.

This is a lock nut proper as distinguished from a washer. No spring which loses its power with use; no sharp edges which destroy bolt or nut thread, or injure nut or rail splice. This lock does not try to cure evils by destruction, but does make use of natural laws with great success and benefit to permanent way. Try it by sending size of bolt and splice to



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EUREKA NUT LOCK.

Strongest Spring Lock Washer Ever Made.

Manufactured from best crucible spring steel. Never known to fail. Made for all sized bolts, for iron or woodwork.

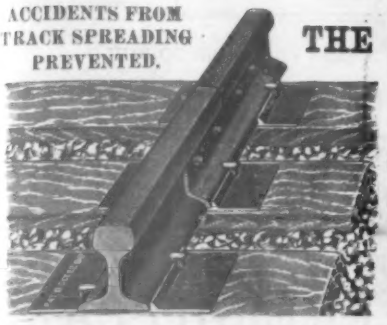
SEND FOR SAMPLES

Made by IRON CITY TOOL WORKS in Conjunction with their Standard Track Tools.

EUREKA NUT LOCK COMPANY,

Thirty-second and Smallman Sts. and A. V. R. R.,
PITTSBURGH, PA.

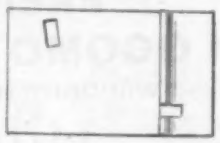
ACCIDENTS FROM TRACK SPREADING PREVENTED.



THE SHOULDER TIE PLATE

1. Prevents Widening of the Gauge. 2. Prolongs the Life of the Tie.
3. Prevents Cutting at Neck of the Spike.

The rail bearing against the shoulder brings into use the inside as well as the outside of spike, doubles the present resistance to lateral thrust and thus effectually prevents spreading of the track.
Especially adapted for use in Yards, at Terminals, and on Curves and Bridges.
THE SHOULDER TIE PLATE is in use on thirteen railroads. Among others, the Norfolk Southern, Central of New Jersey, Louisville & Nashville, Pittsburgh & Western, Long Island, White Electric, Adirondack & St. Lawrence R. R., Louisville Bridge, Bennington & Rutland R. R., etc., etc.



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STEPHEN D. BARNETT, General Eastern Agent, 291 to 305 N. J. R. R. Ave., NEWARK, N. J.

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BY HOT WATER CIRCULATION AND DIRECT STEAM WITH REGULATING DEVICES.
RELIABLE AND UNIFORM HEAT. ECONOMICAL AND RAPID CIRCULATION.
GIBBS' AUTOMATIC COUPLER OF WESTINGHOUSE TYPE, ABSOLUTELY STEAM TIGHT.

THE · LIGHTING · SYSTEM.

THE CELEBRATED PINTSCH COMPRESSED OIL GAS METHOD
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THE BEST, MOST ECONOMICAL AND ONLY SAFE LIGHT FOR RAILROAD PURPOSES.
IN BRILLIANCY AND CLEANLINESS UNSURPASSED.
THIS SYSTEM HAS BEEN ADOPTED BY THE U. S. LIGHT-HOUSE BOARD FOR LIGHTING BUOYS.

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" UNIVERSAL, " " to couple with SEWEL.
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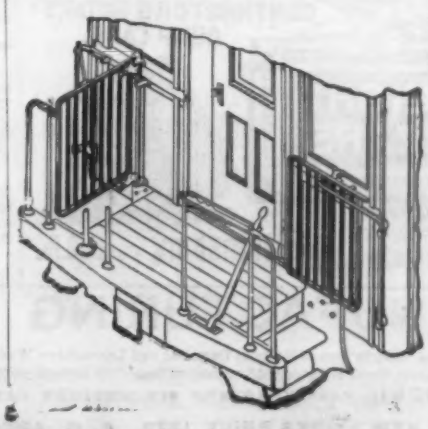

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This cannot happen to passengers where cars are equipped with the

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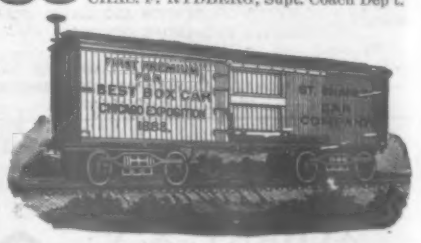
Refrigerator, Excursion and Caboose Cars. Hand, Push and Mining Cars. Castings and Forgings.

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PASSENGER CAR VENTILATORS.

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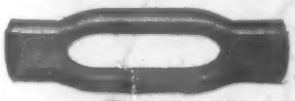

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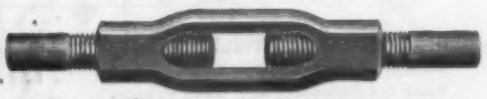

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DROP TEST.

3 Drops..... 8 feet.
2 " ..... 15 "
1 " ..... 40 "

Malleable knuckle without *bend* or *break*, with strap on nose of knuckle.

HAMMER, 2,000 LBS.
Absolutely Automatic.
Pulling Capacity 122,000 lbs.

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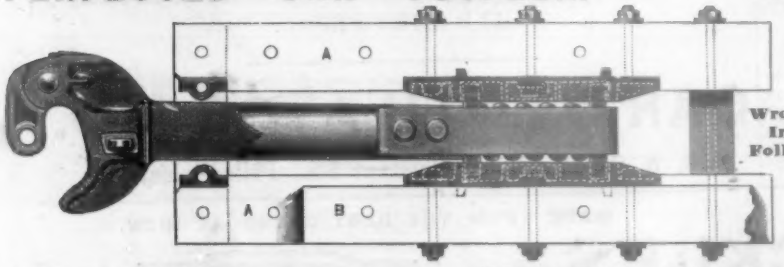

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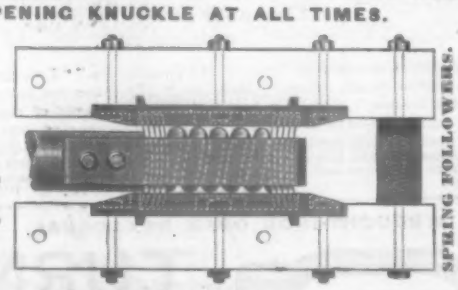

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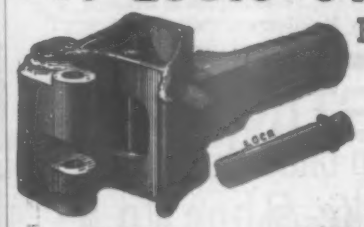

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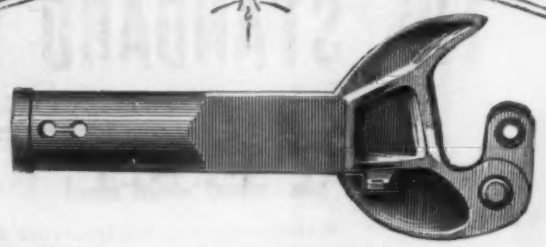

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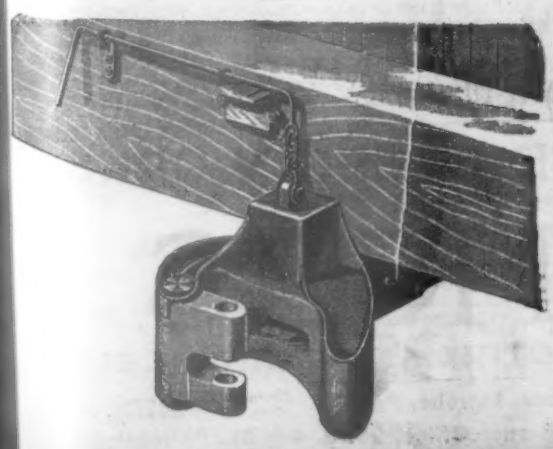

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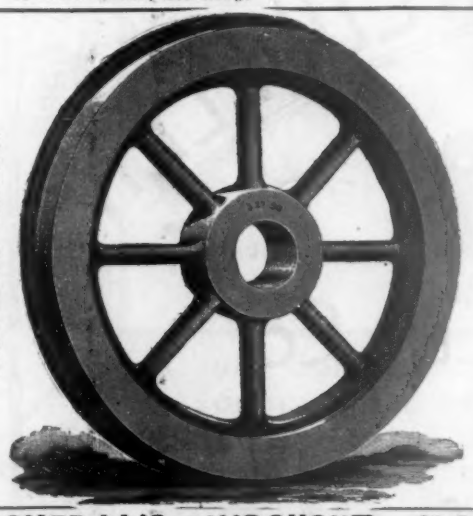

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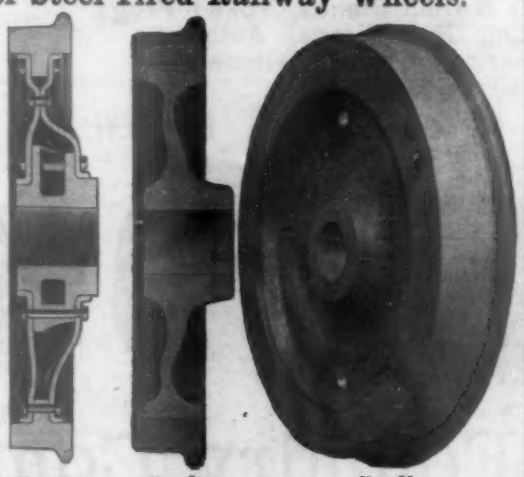

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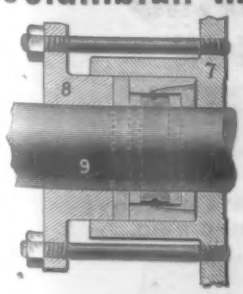

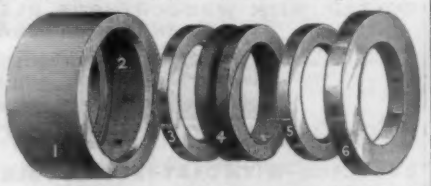

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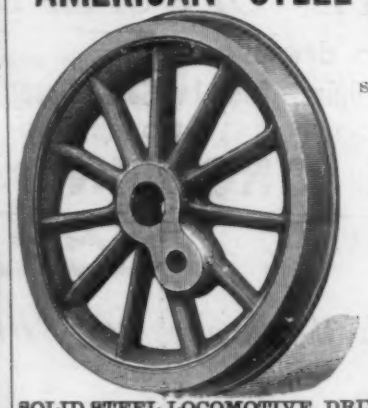

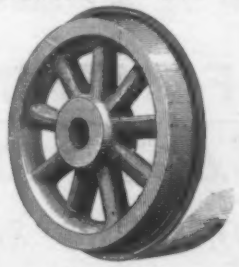

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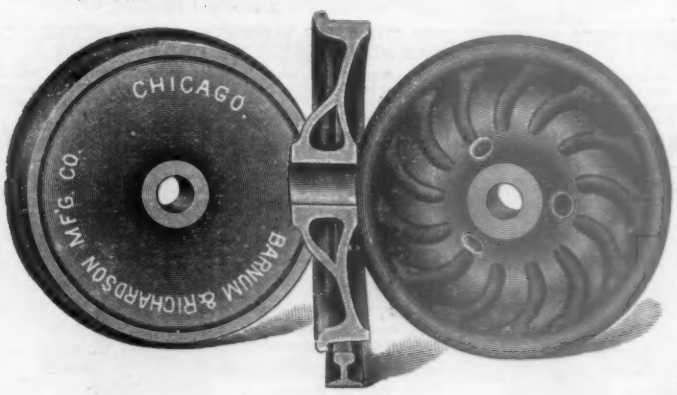

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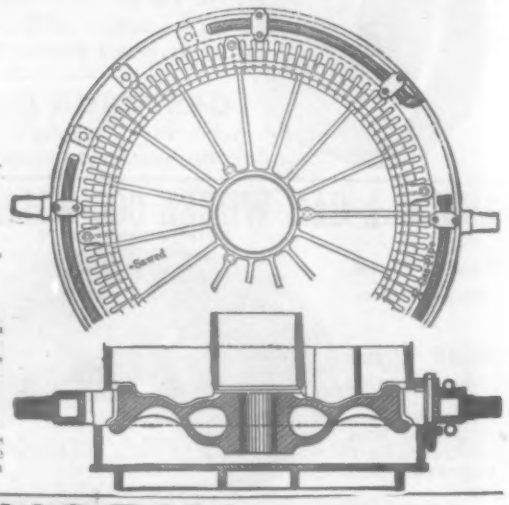

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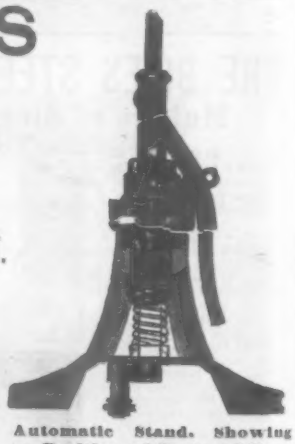

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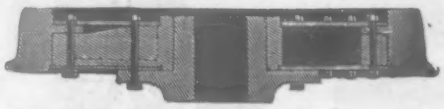

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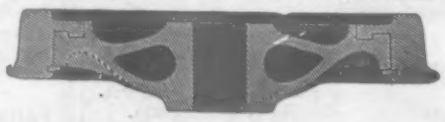

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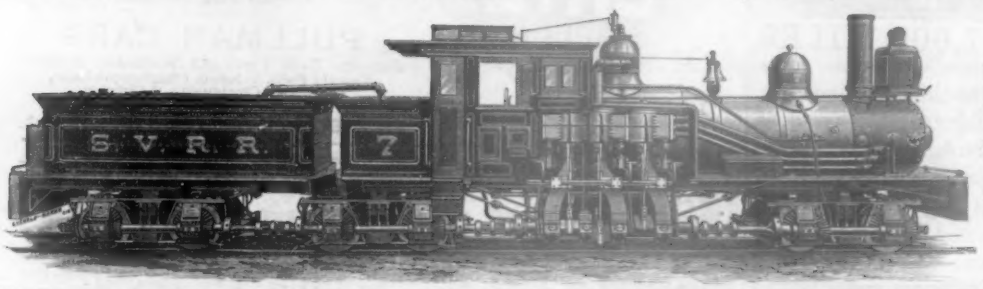

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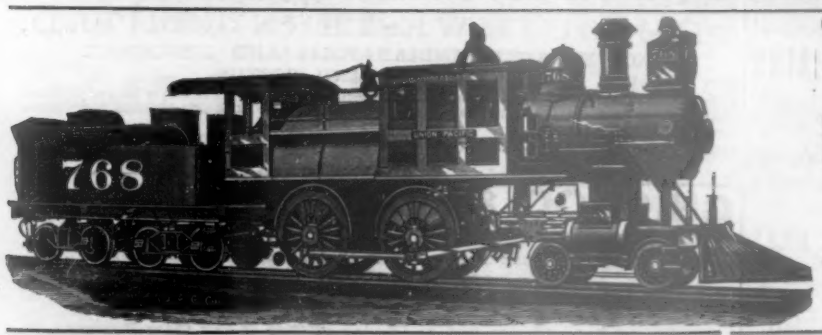

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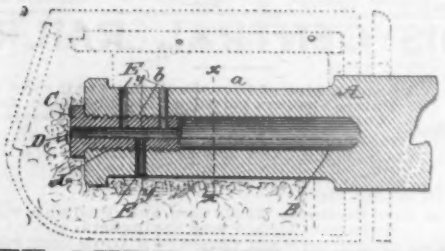

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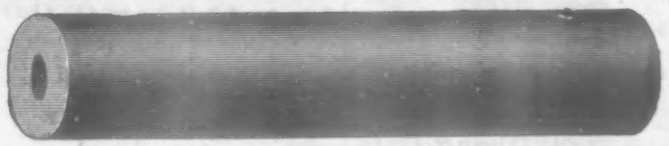

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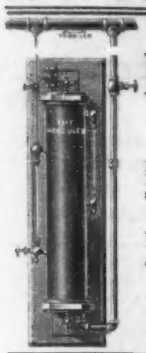

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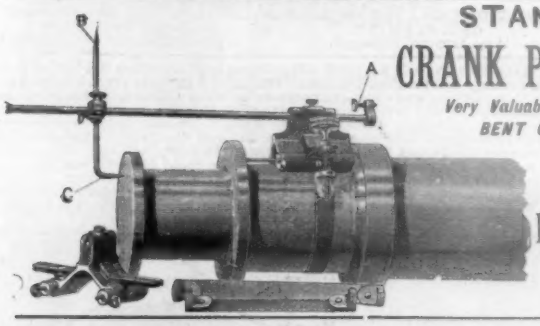

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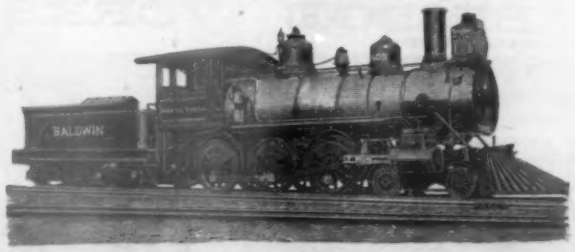

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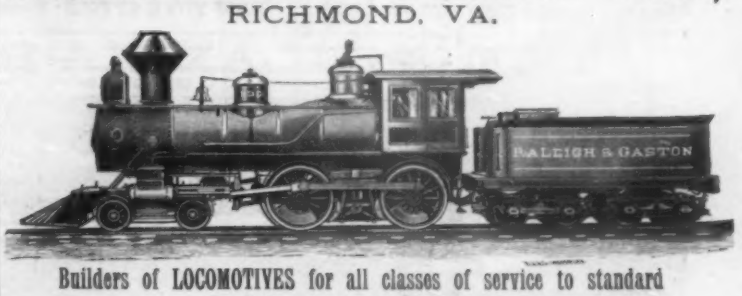

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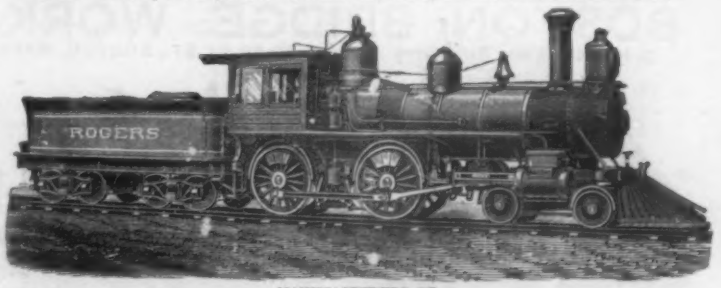

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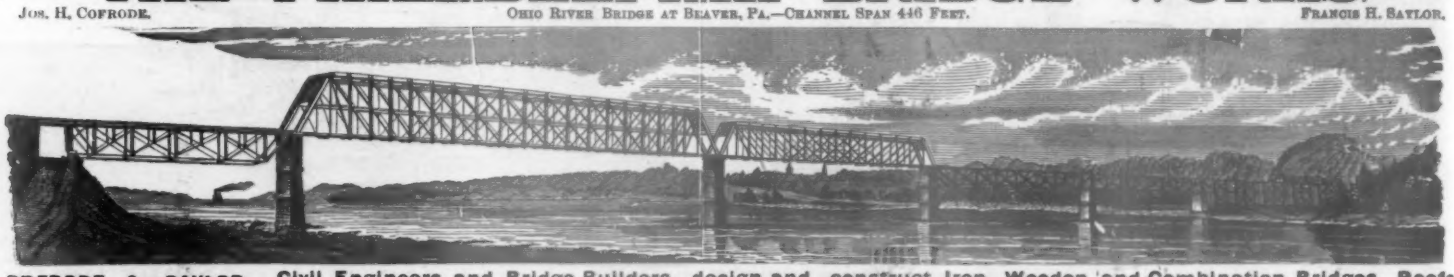

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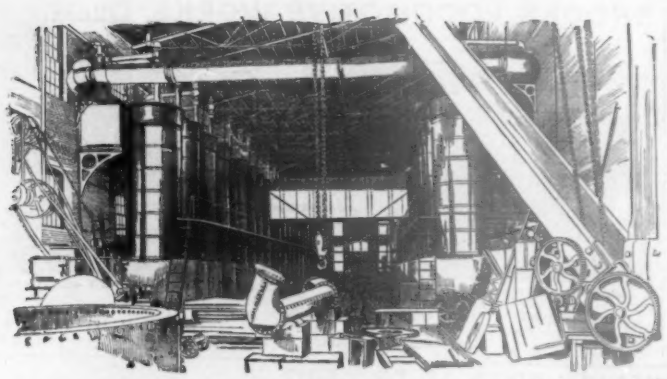

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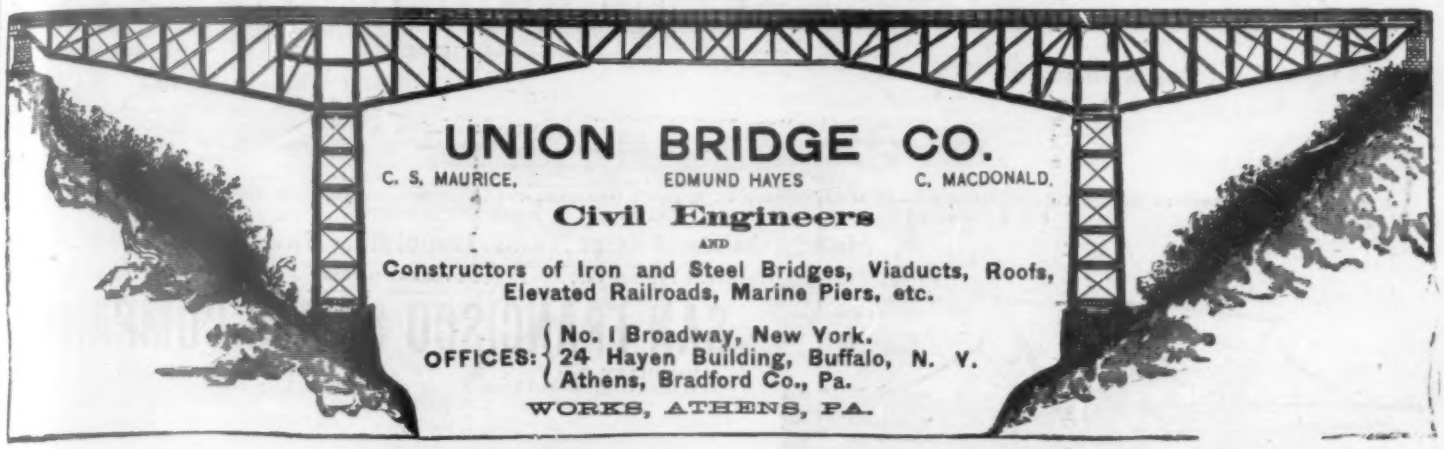

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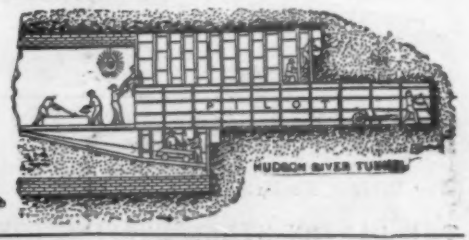

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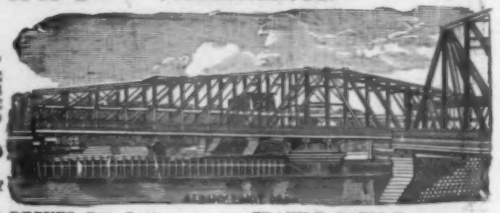

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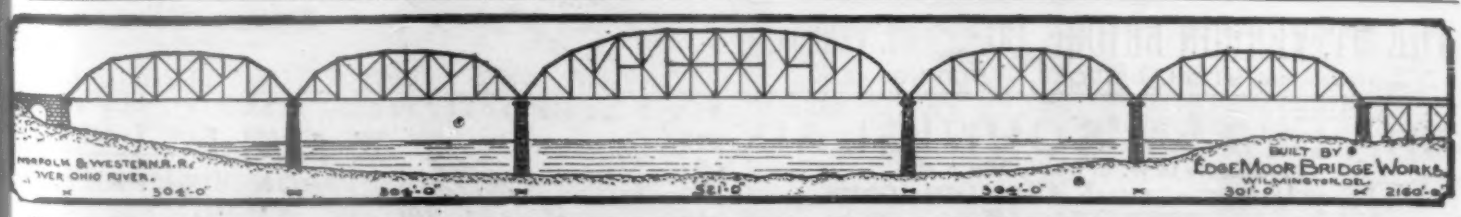

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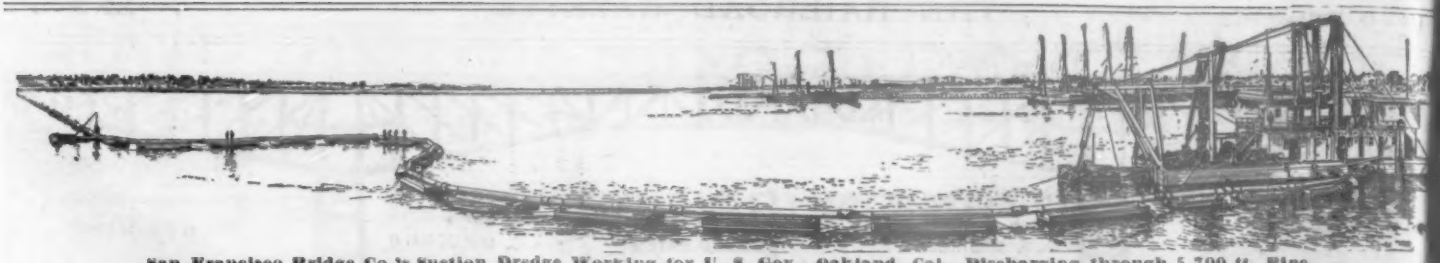

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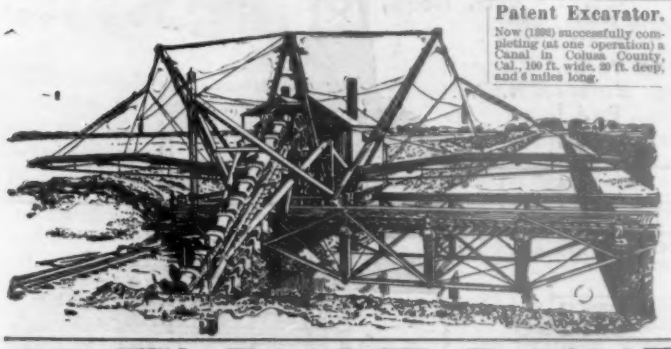

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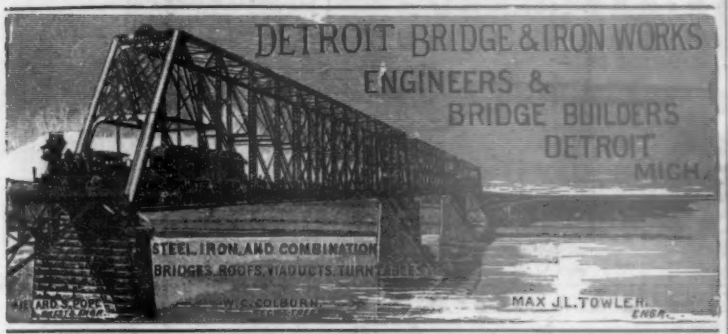

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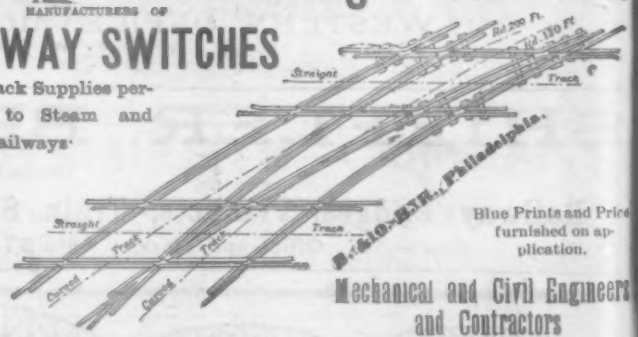

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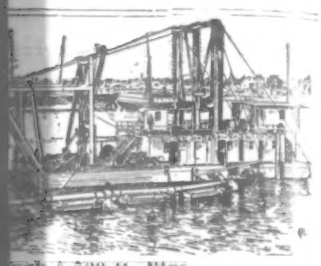

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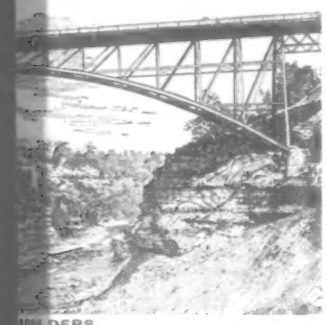

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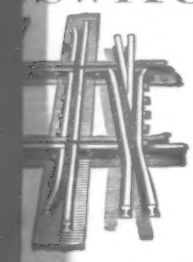

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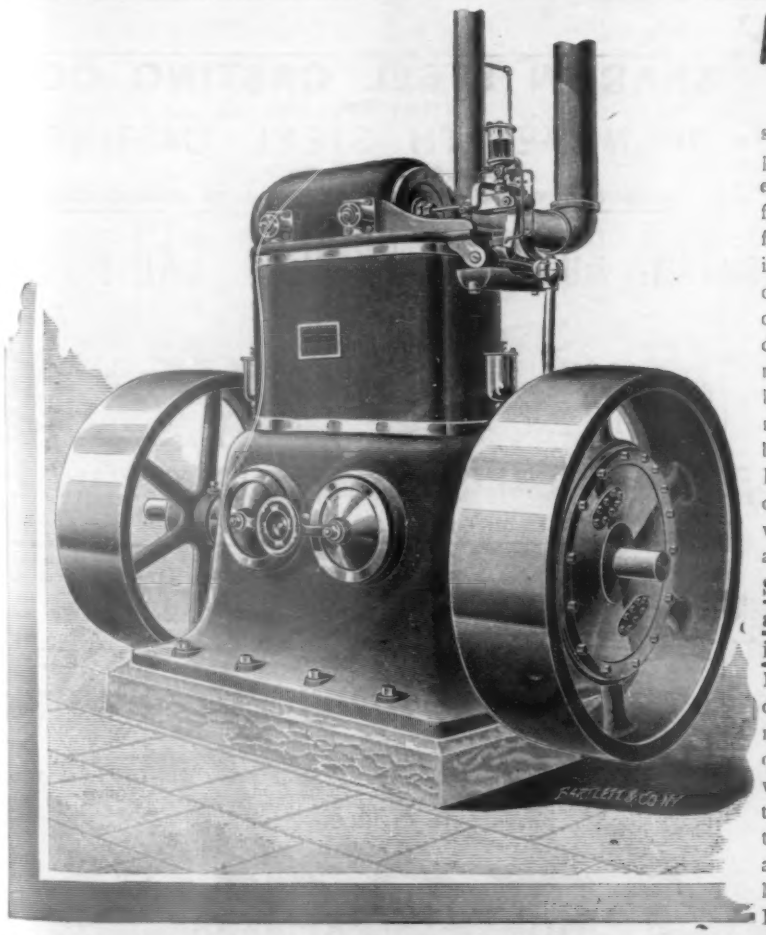

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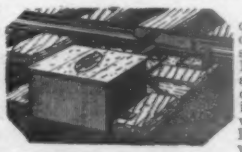
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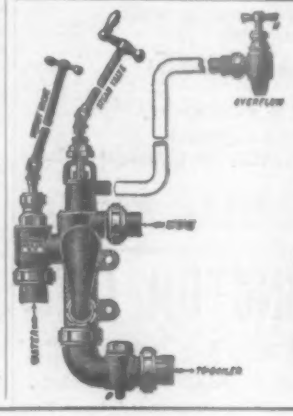

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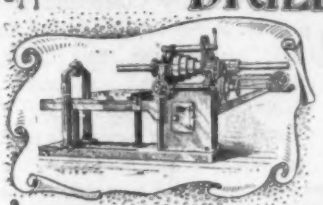
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